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XM-198 GENERATED SHOCK WAVE AND
LOVELACE EXPERIMENTS

Final Report

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) An analysis was performed between the Blast wave forms generated by the M198, 155mm howitzer using the M203 charge and the shock tube of the Lovelace Center for Health Sciences. A cross correlation of data indicated a degree of correlation was possible when the total waveform ensemble was investigated. Some questions were raised as to the consistency of Lovelace shock data and its reproducibility. However, the analysis provided a greater data base and an insight of pressure -- time histories from blast overpressures.		

TABLE OF CONTENTS

	PAGE
SUMMARY.....	1
INTRODUCTION - Explanation of Data Contained in the Appendix	2-10
APPENDIX	11
SECTION A - Introduction and Calibration Data	12-15
SECTION B - 5-Day Summaries of Peak Pressures	16-22
SECTION C - Correlation Studies	23-32
M-198 Reproducibility (30 Nov. 78 Test)	
Shock Tube Reproducibility Correlations	
Between Shock Tube and M-198	
SECTION D - Dynamic Pressure Study	33-38
SECTION E - 1-Day Shot Summaries	39-59
Miscellaneous Pressure Plots	
Daily Peak Variations	
SECTION F - Graphs	60-108
Contract Publication and Personnel109
Distribution List.....110

SUMMARY

In an effort to describe the shock waves produced by firings of the M-203 charge from the XM-198 howitzer (155mm), simulated shock waves were generated in the shock tube of the Lovelace Center for Health Science in Albuquerque, NM. This research project was initiated to determine if the shock tube generated blasts were indeed similar to the howitzer firings. The major areas of investigation centered about the shot-to-shot and day-to-day reproducibility of the pressure fields from the shock tube, and the similarity of peak pressures, rise times and duration of the shock waves.

Data was collected from the XM-198 firings and the Lovelace shock tube. Correlation comparisons were made using statistical analyses. Comparison of data collecting methods, peak pressures, pressure time histories and reproducibility criteria were made.

The major findings indicate that there was a degree of cross correlation between the various shots. There is a question as to the consistency of the shock tube waveforms and its reproducibility. Calibration methods of the instrumentation raised some questions as to effect on the generated recordings. It also appears that more sophisticated methods need to be applied to the pressure time histories for definitive percentages of correlation.

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XM-198 GENERATED SHOCK WAVES AND LOVELACE EXPERIMENTS

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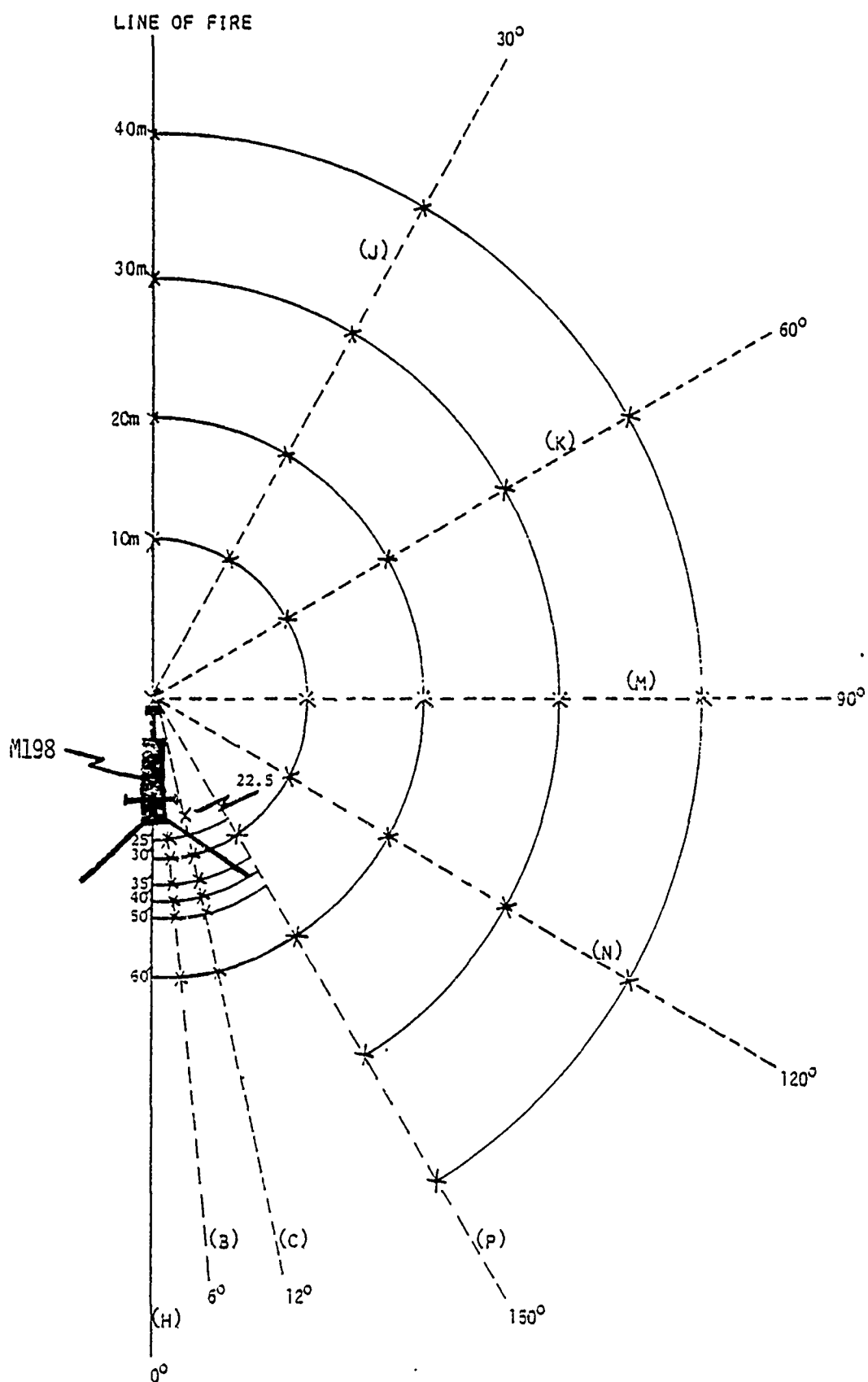
1. INTRODUCTION

This report addresses the issue of simulated howitzer blast shockwaves produced from shock tubes as well as an analysis of data collected from actual howitzer firings. Presently the Lovelace Center for Health Science at Albuquerque, New Mexico is performing experiments to simulate howitzer blasts with their shock tube. The purpose of the shock tube test is two-fold: first, to determine the shot-to-shot and day-to-day reproducibility of the pressure fields generated by the shock tube; and second, to investigate how closely the shock tube pressure simulate those produced from the M-198 howitzer with the M-203 charge. The exact waveforms to be simulated are configured after those generated by the howitzer and measured at station C-22. See Figure 1 for station location and Figure 2 for a display of the waveform.

2. STUDY RESULTS

2.1 Blast overpressures simulations were conducted with an eight foot diameter shock tube at the Lovelace Center for Health Sciences, from March 22 to April 2, 1979. The tests consisted of a series of rapidly fired explosions (25 shots, one every 20 seconds) in the shock tube using primer cord. The resulting explosions when propagated through the shock tube are intended to simulate a howitzer blast as measured from the C-22 position. Pressure measurements were taken during the tests to characterize the blast wave on axis and off axis to the shock tube (see Figure 2). Due to the extremely high intensity blast from the shock tube it was felt necessary to measure not only static pressure but also dynamic pressure. Static pressure was measured at each location with a sensor face oriented normal to the shock tube axis; while dynamic pressure was measured with a sensor head-on. The test plan, execution and pressure data collection was performed by personnel from the Lovelace Laboratory.

2.2 The data collected on the shock tube test was dubbed by JAYCOR personnel at Lovelace Laboratory and digitized by Triadic Research of California.



TRANSDUCER LOCATIONS FOR THE M198 FIRINGS

Figure 1

DAY 4 TRANS2 LOVEFACE ENSEMBLE

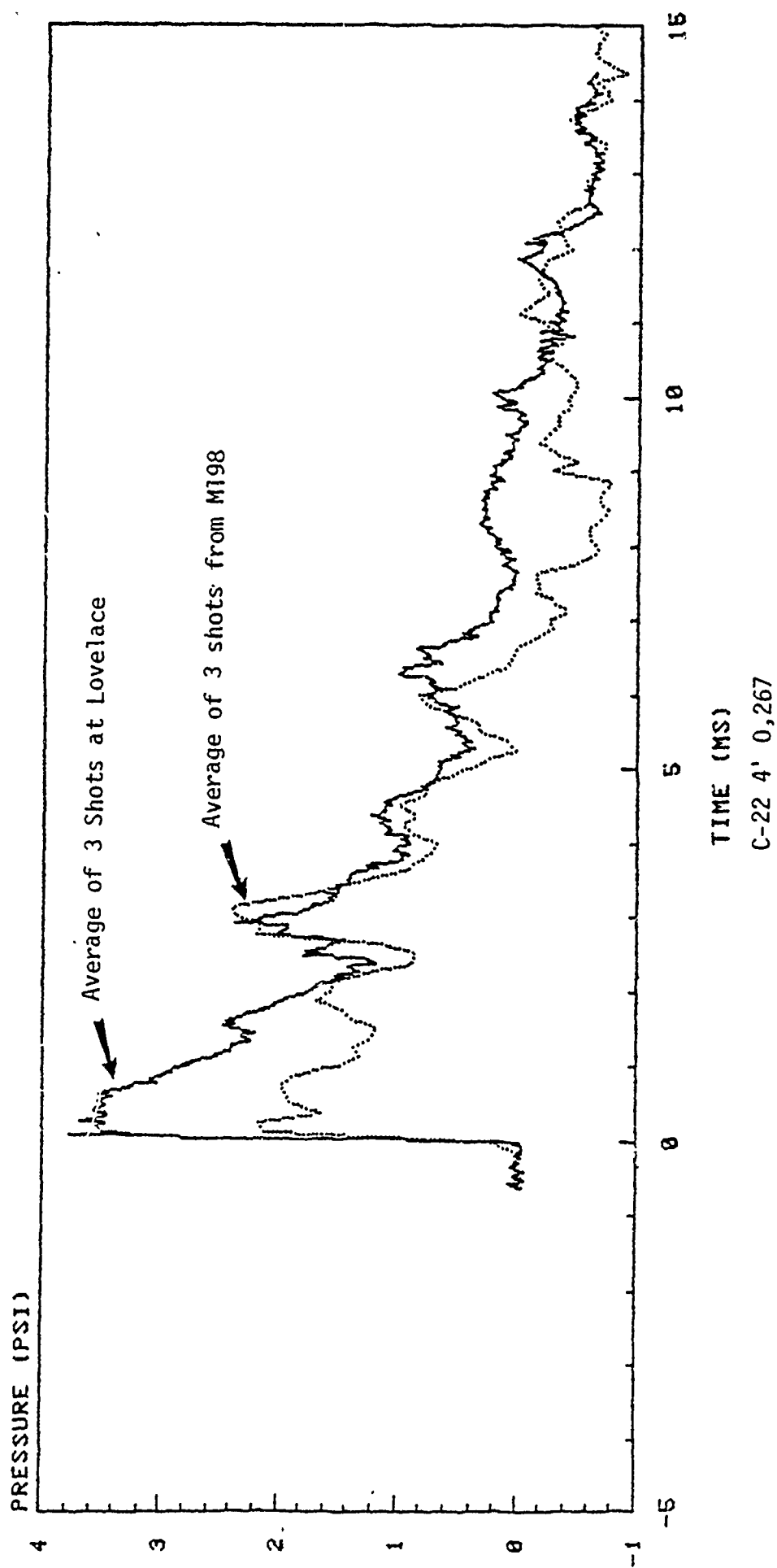


Figure 2

The data was digitized at an 800KHZ rate with a two pole besse1 maximum flat cutoff filter set at 20KHZ. After the data was digitized it was sent to JAYCOR's East Coast laboratory for data reduction and analysis on the company's VAX 11/780 computer. In addition to the shock tube data reduction and analysis, some actual howitzer firing data and associated analysis has been included in this report such as: the reproducibility of the M-198 gun test performed in November 1978, at Aberdeen Proving Grounds, correlation between the shock tube and the M-198 howitzer and dynamic pressure resulting from the shock tube test. The results of the data reduction and analysis are contained in the Appendix to this report.

2.3 Section A of the Appendix contains a short description of the reduction and analysis of the data. The calibration data is also discussed. Although Lovelace Laboratory and the U.S. Army Aeromedical Research Laboratory (USAARL) use the same type of transducers to record the overpressure data, their means of calibrating are different. On the whole the USAARL calibration factor leads to peak pressures about 10% below the Lovelace results. Though this difference in scaling does not affect the correlation and reproducibility studies, care was taken in comparing parameters involving units of pressure when examining data from both groups.

2.4 Section B of the Appendix contains the five-day summaries of the recorded peak overpressures, B-durations and positive impulses of each transducer location. The daily averages and standard deviations are also included.

2.5 Section C of the Appendix is divided into three parts. The first part is a reproducibility study of the M-198 howitzer. The data used in this study was obtained during the November 30 - December 1, 1978 firings of the M-198 at Aberdeen Proving Grounds. Included are shot to shot comparisons at single locations. The statistics used for comparison are the cross correlation coefficient, the skewness and the kurtosis. These terms are defined in Section C.

2.5.1 The second part of Section C contains a reproducibility study of the shock tube firings similar to those studied for the howitzer.

2.5.2 The last part of Section C is a comparison between the howitzer and the shock tube. Since it is not known what characteristics of the overpressure time history are most important in causing auditory and/or internal damage to a human or animal, the greatest measure of comparison of waveforms was used, i.e., the

total waveform duration. In the future, when dose response data is available, more sophisticated correlation studies can be employed to ascertain the critical parameters.

2.6 Section D of the Appendix is a study of the dynamic pressures at the shock tube.

2.7 Section E of the Appendix contains a more detailed recording of each shot at Lovelace.

2.8 The last section of the Appendix (Section F) contains representative pressure time histories of the shock tube and howitzer firings. Also included are graphs of the shot to shot changes in peak pressures from the shock tube. This section of the report is scheduled to be expanded in the near future when a more precise graphics capability becomes available.

3. CONCLUSIONS

3.1 Conclusions from the analysis of the Lovelace shock tube experiments as well as the other data included in this report fall into two categories:

- o General (i.e., over all conclusions)
- o Specific (i.e., specific comments about various phenomenon recorded in the analysis)

3.2 Of the two categories of conclusions, the first is more difficult to quantify because the method for collection and analysis of data is still being tested and studied. In addition, the protocol for performing data analyses has not been fully established, nor for that matter has it been determined what information is clearly relevant and required in the analysis. Therefore, given the above parameters, the general conclusions that can be made are:

- o Calibration is an important issue to the program especially since it is not known which phenomena in a howitzer blast/shock are important. In addition, because this program is likely to receive high visibility, data accuracy is essential.
- o Correlation between the shot data of Lovelace appear satisfactory (i.e., $> .7$). However, because the initial impulses so dominate the correlation analysis due to their magnitude, the time history after

the impulses has a lesser correlation, while the total correlation is still high. Thus, a conclusion that considers the total time history of a waveform as well as correlation could be misleading.

- o Cross correlation of total waveforms of the type being measured may not be an accurate method of determining whether the waveforms are the same.
- o It appears that further correlation analysis of the data should focus on very specific characteristics relating to the waveform, such as the first 20 ms, or the rise time or total peak pressure.
- o It would appear that it is more important to determine a cause-effect relationship between blast-overpressure and human injury than it is to collect data on howitzers with little understanding of what are the important parameters. Thus the theoretical aspects of the physics and physiology of the problem must be characterized and understood in detail so that a proper data collection and analysis protocol can be developed. Analytical tools such as fluid dynamic codes as well as physiological codes of the human chest must be developed to gain a proper insight into the important parameters.

3.3 Conclusions and observations of a specific nature are as follows:

3.3.1 Calibration

3.3.1.1 In the Lovelace tests two different means of calibrating the ST-2 transducers (sensors) were used. The method used by Lovelace Laboratory consists basically of two chambers connected together; a large chamber which is pumped to approximately 5 psi overpressure and a smaller chamber in which the transducer is located. A valve on the large chamber is released and a positive pulse enters the other chamber. After traveling through the system a negative pulse is reflected back. Consequently the transducer record shows a positive pulse which returns to zero followed by a negative pulse. The difference in volts between the ambient and the peak of the negative pulse corresponds to 5 psi.

3.3.1.2 USAARL favors an oscillating (90hz) source with a peak pressure of 153db (0.1296 psi). The difference in volts between the average positive peak and the average negative peak corresponds to 0.2592 psi.

3.3.1.3 The calibration factor (psi/volt) generally is 10-15% lower for the oscillator calibration.

3.3.1.4 At first it would appear the calibration by pulses would be preferred as the transducers are being used to measure pressure pulses from the shock tube. However, the rise times on the pulse calibration records are much slower than in the pressure fronts from the shock tube or the howitzer. This may be due to inadequate release values on the major chamber. If this is the case, then it may be that the pulse in the smaller chamber is not reaching a full 5 psi. Consequently the calibration factor from the pulse will be higher.

3.3.1.5 Based on the data available a decision as to which method is superior cannot be made. It is suggested that tests be run on a laboratory shock tube where the actual pressures are theoretically known to see which calibration method is more accurate.

3.3.1.6 Calibration were conducted before and after the firings. Although the firings lasted approximately 8 minutes the preshot and postshot calibration factors differed for both calibration systems. Except for transducer 1, the difference amounted to generally no more than 2-3%. This corresponds to about 0.1 psi for a total peak value of 4 psi or a few tenths of a dB. This range appears to be acceptable. However, if the firings are to last a considerable period of time, it appears prudent to make calibration tests more frequently.

3.3.2 Five Day Shock Tube Series

3.3.2.1 As can be seen from the data in the Appendix (Section B) there is considerable variation in the shot-to-shot peak recorded overpressures, particularly on the head-on gages #1 and #3. Because of the reflection off the face of these gages the peak recorded pressure should be on the order of 8-9 psi. The use of the 20KHz analog filters flattened these sharp spikes down to the 5-7 psi range as shown in the tables. Nevertheless, enough of the spike was recorded that considerable shot-to-shot peak variation was present at a sampling rate of 80KHz.

3.3.2.2 The grazing gages #2 and #4 varied less in shot-to-shot peak values. The daily deviation was around 10-15% of the daily average peak value. The variation appears large enough to assume there is significant difference in the shot-to-shot tube firings. For example, the first few shots in each day tend to be louder; 84% of the time either the first or second shot was among the top

three in maximum overpressure. At the other extreme shot #18 on day 3 had the lowest recorded maximum on three of the four transducers and was second lowest on the fourth shot for that day.

3.3.2.3 The daily averages on gages 1, 2 and 4 were fairly steady with the exception of day 2 on gage 4.

3.3.2.4 In the majority of cases the daily standard deviation in the positive impulses was under 10% of the average value. Surprisingly, the daily averages differed considerably.10v

3.3.2.5 This difference would tend to indicate a day-to-day change in some type of conditions. The large difference between and within group variances would tend to support this conclusion.

3.3.2.6 The B-durations were widely scattered. Part of this is due to the sensitivity of the B-duration to the peak pressure. A small change in peak pressure can lead to a large change in B-duration. This was noted in the previous analysis of the Aberdeen M-198 howitzer data. In numerous cases B-duration of 100-200 ms were recorded, especially on day 3 for gages 1 and 2. Sometimes the long B-duration is accompanied by a very low peak pressure. This may be due to the digitizer missing the peak or to electronic problems in the transducer or other equipment. Other long B-duration records contain considerable noise. This may be due to a ringing in the shock tube or to electronic problems. This was particularly noticeable on day 3 where some of the gage 2 recordings were unusable for analysis.

3.3.3 Correlation results

The correlation coefficient between shots at Aberdeen and between shots at Lovelace were in the neighborhood of 0.9. When comparing Aberdeen records to Lovelace records the correlation dropped to 0.8. This correlation coefficient seems quite high. It may be that the correlation coefficient is too insensitive to differences in the pressure time histories when long record lengths are used (in this report 75 and 150 ms were used). Recommend further study be made to find the record length which best differentiates between two pressure time histories.

3.3.4 Dynamic Pressure

As explained in Appendix (Section D), the sampling rate was insufficient to obtain an accurate measure to the peak dynamic pressure to compare with theoretical values. However, as the graphs in Section D show, there was more dynamic pressure present at the shock tube than at the howitzer, as was expected.

3.3.5 One Day Summaries

3.3.5.1 In addition to several other parameters two different estimated maxima are presented. The first one (labeled EI) is an attempt to correct for sampling errors. Using sampling theory it attempts to predict the actual maximum occurring on the analog record. The other estimation (labeled LST SQ MAX) is an attempt to correct for the finite rise time and/or overshoot of the transducers. The reliability and accuracy of these estimations can be determined only a study of the peaks at very high sampling rates is made.

3.3.5.2 Included in the One Day Summaries are three base line checks. The first one called DRIFT is the slope of a least squares line fitted through the preshot record. In all cases except one, the value of the slope was zero to two decimal places. A nonzero value would give an indication that there was some problem in the electronics. The parameter SD is the standard deviation of the preshot record. Its value gives an estimation in the error at each point. The parameter BASE gives the time interval before pulse arrival of the last point at which the preshot record exceeded 5% of the difference between the maximum and minimum recorded levels. It is an indication of preshot noise. A value of 0 for BASE means that no preshot point exceeded the 5% criteria.

APPENDIX

REPORT ON THE LOVEFACE SHOCK TUBE TESTS

CONTENTS:

SECTION A	INTRODUCTION AND CALIBRATION DATA
SECTION B	5-DAY SUMMARIES OF PEAK PRESSURES, B-DURATIONS AND IMPULSES
SECTION C	CORRELATION STUDIES: M-198 REPRODUCIBILITY (30 NOV TEST) SHOCK TUBE REPRODUCIBILITY CORRELATIONS BETWEEN SHOCK TUBE AND M-198
SECTION D	DYNAMIC PRESSURE STUDY
SECTION E	1-DAY SHOT SUMMARIES
SECTION F	GRAPHS: MIS. PRESSURE PLOTS DAILY PEAK VARIATIONS

SECTION A

INTRODUCTION AND CALIBRATION DATA

REPORT ON THE LOVELACE SHOCK TUBE OVERPRESSURE DATA.

TESTS OF 23 MARCH - 2 APRIL 1979
ANALYSIS PERFORMED BY JAYCOR

I. DATA REDUCTION.

THE DATA WAS RECORDED BY LOVELACE LABORATORY. THE ORIGINAL ANALOG TAPE WAS DUBBED BY JAYCOR PERSONNEL AT ALBUQUERQUE.

THE DUBBED ANALOG TAPES WERE SENT TO TRIADIC RESEARCH IN LA JOLLA TO BE DIGITIZED. THE TAPES WERE DIGITIZED AT A SAMPLING RATE OF 80 KHZ WITH A 2-POLE BESSEL PREFILTER. THE PREFILTER WAS SET AT 20 KHZ.

THE DIGITIZED TAPES WERE PROCESSED AT THE JAYCOR FACILITIES IN ALEXANDRIA ON A VAX 11/780 COMPUTER.

II. DATA ANALYSIS

THE DATA WAS FIRST PROCESSED BY DECIMATING THE 80 KHZ RECORDS TO 40 KHZ, I.E., EVERY OTHER POINT WAS USED. IT WAS NOTICED THAT ON THE RECORDS OF THE FACE-ON GAGES (TRANSDUCERS 1 AND 3) THE SHARP PEAK FROM THE REFLECTION OF THE SHOCK WAVE OFF THE FACE OF THE TRANSDUCER WAS NOT COMPLETELY REMOVED BY THE PREFILTER. CONSEQUENTLY THE RECORDED MAXIMUM OVERPRESSURES FOR THESE GAGES VARIED CONSIDERABLY FROM SHOT TO SHOT. THIS IS BECAUSE SOMETIMES THE MAXIMUM POINT CATCHES THE PEAK NEAR THE MAXIMUM AND SOMETIMES IT MISSES IT.

TO TRY AND GET A MORE UNIFORM PEAK RECORDED LEVEL IT WAS DECIDED TO GO BACK TO THE 80 KHZ RECORDS AND RECOMPUTE THE MAXIMUM LEVELS. THIS WAS DONE NOT ONLY ON THE FACE-ON GAGES BUT ALSO ON THE GRAZING GAGES (TRANSDUCERS 2 AND 4). THE RESULTING OVERPRESSURES ARE REPORTED ON THE 5 DAY SUMMARY ANALYSES. ALL OTHER DATA ON THE 5 DAY SUMMARY ANALYSES AND ALL THE DATA ON THE 1 DAY SUMMARIES ARE TAKEN FROM THE 40 KHZ RECORDS.

ALTHOUGH USING THE FULL SET OF DATA LESSENNED THE VARIANCE OF THE PEAK PRESSURE LEVELS, THE PEAK PRESSURES FOR GAGES 1 AND 3 STILL CONTAIN A COMPONENT OF THE TRANSDUCER FACE REFLECTED PULSE AND SHOULD NOT BE INTERPRETED AS THE GRAZING PRESSURE PLUS THE DYNAMIC PRESSURE. THE ESTIMATED PEAK PRESSURES REPORTED ON THE 1 DAY SUMMARIES IS PERHAPS A BETTER INDICATION OF THE ACTUAL PEAK LEVELS, ALTHOUGH AGAIN THE SHAPES OF THE CURVES VARIED SO MUCH THAT SOME OF THE ESTIMATES GIVE MISLEADING RESULTS.

AS THERE IS LITTLE IF ANY REFLECTION OFF THE FACE ON THE SIDE C_N GAGES. THE RECORDED VALUES SHOULD BE QUITE ACCURATE.

IN THE PROCESS OF DIGITIZATION THE PEAKS OF THE PULSES ON TRANSDUCERS 3 AND 4 FOR DAY 1 ONLY WERE CLIPPED. CHANNEL 4 HAS BEEN REDIGITIZED AND THE RESULTS ARE INCLUDED IN THIS REPORT. CHANNEL 3 DAY 1 WAS NOT REDIGITIZED.

OF SHOTS, ESPECIALLY ON TRANSDUCERS 1 AND 2 FOR DAY 3 THERE WAS A LOT OF NOISE AND A CORRESPONDINGLY LONG DURATION. THE RECORDS WITH LONG (OVER 100 MS.) D-DURATIONS WILL BE LOOKED AT IN DETAIL.

III. CALIBRATION INFORMATION.

PRIOR TO AND FOLLOWING EACH DAYS SET OF 25 SHOTS FIELD CALIBRATIONS WERE MADE. EACH TRANSDUCER WAS CALIBRATED USING LOVELACE'S PULSE CALIBRATOR AND USAARL'S HIGH INTENSITY CALIBRATOR.

*****ALL THE RESULTS PRESENTED USE THE PULSE CALIBRATION*****

TO FIND WHAT THE PRESSURE LEVELS WOULD BE IF THE USAARL CALIBRATION WAS USED MULTIPLY THE PRESSURES BY THE FOLLOWING FACTORS:

DAY	TRANS	FACTOR
1	1	0.970
	2	0.939
	3	0.876
	4	0.890
2	1	0.801
	2	0.906
	3	0.874
	4	0.890
3	1	0.869
	2	0.889
	3	0.890
	4	0.891
4	1	0.843
	2	0.899
	3	0.892
	4	0.895
5	1	0.864
	2	0.909
	3	0.898
	4	0.871

BESIDES ALL THE PRESSURES, THE IMPULSES CAN BE CONVERTED TO THE USAARL CALIBRATION BY MULTIPLYING BY THESE FACTORS. THE A AND B DURATIONS AND ANY OTHER TIME MEASUREMENTS WILL NOT BE AFFECTED BY THESE SCALING FACTORS.

CALCULATOR SHEET.

THE FIGURES GIVEN ARE (PRESHOT CAL FAC - POST SHOT CAL FAC)/PRESHOT CAL *100%.

FUDGE OSCILLATOR

DAY 1	GAGE 1	-15.5%	5.3%
	GAGE 2	-1.9%	-6.1%
	GAGE 3	*****	-4.6%
	GAGE 4	-2.3%	0.5%
DAY 2	GAGE 1	*****	5.6%
	GAGE 2	1.1%	-0.2%
	GAGE 3	*****	*****
	GAGE 4	0.0%	1.1%
DAY 3	GAGE 1	*****	10.9%
	GAGE 2	1.3%	3.9%
	GAGE 3	2.0%	2.1%
	GAGE 4	2.3%	1.2%
DAY 4	GAGE 1	*****	7.5%
	GAGE 2	2.4%	0.8%
	GAGE 3	-1.1%	-4.6%
	GAGE 4	5.3%	2.5%
DAY 5	GAGE 1	*****	8.9%
	GAGE 2	3.2%	2.4%
	GAGE 3	*****	1.1%
	GAGE 4	3.1%	3.6%

SECTION B

5-DAY SUMMARIES OF PEAK PRESSURES,
B-DURATIONS AND IMPULSES

```

5 DAY SUMMARY DATA

*****STATISTICS*****
LE I
I= GROUP INDEX (HERE DAY)
J= DATA POINT IN GROUP (HERE SHOT NUMBER)
X(I,J) = JTH DATA POINT IN THE ITH GROUP
K=NUMBER OF GROUPS
N(I)= NUMBER OF DATA POINTS IN ITH GROUP
I= TOTAL NUMBER OF DATA POINTS

*****DAILY AVERAGE***
AVE(I)=AVERAGE OF THE ITH GROUP=(1/N(I))* SUM X(I,J)
      J=1

*****DAILY VARIANCE***
VAR(I)=VARIANCE OF THE ITH GROUP=(1/(N(I)-1))* SUM(X(I,J)-AVE(I))**2
      J=1

*****GRAND AVERAGE*** GAVE IS THE AVE OF ALL DATA POINTS
*****GRAND VARIANCE*** GVAR IS THE VARIANCE OF ALL POINTS

*****VARIANCE BETWEEN GROUPS***
      N
      I=1 SUM N(I)*(AVE(I)-GAVE)**2
      I-1

*****VARIANCE WITHIN GROUPS***
      N N(I)
      I=1 SUM SUM (X(I,J)-AVE(I))**2
      J=1

*****IMP*** IS THE POSITIVE IMPULSE. IT IS THE SUM OF THE PRESSURES
FROM PULSE ARRIVAL TO THE FIRST TIME THE PRESSURE BECOMES
NEGATIVE OR TO THE ARRIVAL OF THE REFLECTED PULSE (WHICHEVER
IS SOONER) PLUS THE SUM OF THE PRESSURES FROM THE ARRIVAL OF THE
REFLECTED PULSE TO THE NEXT TIME IT BECOMES NEGATIVE.

```

LOVELACE TEST, MARCH 1979

SUMMARY OF RESULTS: TRANSDUCER 1

ON AXIS --- FACE-OR. MAXIMA ARE FROM 80K RECORDS

DAY 1				DAY 2				DAY 3				DAY 4				DAY 5			
ST	MAX REC	POS	IMP	ST	MAX REC	POS	IMP	ST	MAX REC	POS	IMP	ST	MAX REC	POS	IMP	ST	MAX REC	POS	IMP
1	6.5	187.8	68.2	12.7	1	7.1	187.1	69.5	14.4	1	7.3	187.6	61.7	13.3	1	6.7	185.8	61.5	11.5
2	5.2	185.8	71.0	14.2	2	8.8	189.0	38.5	12.6	2	8.0	188.4	43.3	13.0	2	7.1	186.3	53.4	10.0
3	5.4	186.1	68.1	13.4	3	5.8	185.4	83.1	14.0	3	7.3	187.6	39.9	13.5	3	5.4	183.9	67.8	12.3
4	6.0	187.1	67.4	13.8	4	5.8	185.4	81.0	13.3	4	5.0	184.3	71.0	12.7	4	6.3	185.3	67.3	13.7
5	5.6	186.4	66.8	13.5	5	6.5	186.3	67.0	13.2	5	5.6	185.3	67.0	12.2	5	6.2	185.2	67.0	12.2
6	5.8	186.7	66.0	13.9	6	6.3	186.1	67.7	13.5	6	6.1	186.0	67.0	12.2	6	4.8	182.9	67.0	13.5
7	6.6	187.8	37.4	13.6	7	7.3	187.3	46.6	10.3	7	6.5	186.6	67.0	12.5	7	6.5	185.6	61.6	13.3
8	5.5	186.3	67.9	14.2	8	6.9	186.8	67.9	12.6	8	5.8	185.5	67.1	12.2	8	5.7	184.5	67.1	12.8
9	6.0	187.1	67.4	13.7	9	5.3	184.6	67.0	11.4	9	6.0	185.3	67.2	11.6	9	6.3	185.3	67.2	11.6
10	5.3	186.0	72.6	13.5	10	4.7	181.5	66.6	12.4	10	7.0	187.2	39.0	12.4	10	5.7	184.4	67.0	13.1
11	5.2	185.7	55.5	13.5	11	6.5	186.3	52.4	11.4	11	7.3	187.5	81.2	11.4	11	4.7	182.9	67.0	13.5
12	6.1	187.2	68.6	12.8	12	6.7	186.5	45.9	11.6	12	4.1	182.5	0.0	13.3	12	5.4	184.0	81.8	13.1
13	5.5	186.3	68.1	12.7	13	6.9	186.8	67.0	13.5	13	5.8	185.6	0.0	11.4	13	6.7	185.8	82.5	12.6
14	5.0	185.5	68.3	13.3	14	7.8	187.9	66.8	13.0	14	5.2	184.6	0.0	10.6	14	7.9	187.3	67.4	12.2
15	5.9	186.9	68.1	12.9	15	6.3	186.0	47.7	12.8	15	4.8	183.9	0.0	11.2	15	6.0	184.9	67.9	13.7
16	5.7	186.6	70.6	13.0	16	5.7	185.1	67.5	13.1	16	6.6	186.8	0.0	10.4	16	7.4	186.6	67.8	12.4
17	6.1	187.1	67.6	12.7	17	6.5	186.3	67.2	11.5	17	6.7	186.9	9201.9	12.4	17	6.1	185.3	67.9	12.1
18	6.7	188.0	43.4	12.3	18	5.4	184.7	67.1	12.9	18	4.0	182.5	0.0	12.3	18	6.3	185.3	3139.9	12.4
19	7.4	188.8	68.3	0.0	19	5.4	184.6	67.2	14.3	19	6.0	185.9	9118.7	11.6	19	6.5	185.6	67.9	12.9
20	5.8	186.7	67.5	13.2	20	6.5	186.3	67.2	13.1	20	7.0	187.2	46.7	11.3	20	5.3	183.8	85.3	13.7
21	6.4	187.6	67.0	13.9	21	3.8	181.6	68.8	13.0	21	7.6	188.0	59.1	11.6	21	5.7	184.4	4175.0	13.3
22	5.7	186.5	66.6	14.8	22	5.0	184.1	1134.1	12.7	22	5.8	185.3	3201.6	11.4	22	6.1	184.9	68.7	12.8
23	5.7	186.5	67.5	13.9	23	4.7	181.5	70.9	12.4	23	6.5	186.6	68.5	11.9	23	5.7	184.4	4153.6	12.6
24	5.8	186.8	67.6	14.3	24	5.3	184.5	5138.1	12.6	24	5.5	185.3	1208.7	13.6	24	5.0	183.4	4171.5	12.9
25	6.0	186.9	67.8	15.1	25	5.3	184.5	5120.4	12.9	25	5.6	185.3	76.8	11.6	25	6.2	185.2	81.2	12.0

OVERPRESSURE SUMMARY (PSI)

DAILY AVERAGE	5.9	6.1	6.1	6.1
STD. DEV.	0.53	1.10	1.04	0.78
DAILY VARIANCE	0.29	1.21	1.09	0.61
GRAND AVERAGE AND VARIANCE	6.1 0.90			
VARIANCE BETWEEN GROUPS	0.38			
VARIANCE WITHIN GROUPS	0.91			

DAILY MAX. AND SHOT NO. 7.4 19 9.8 2
DAILY MIN. AND SHOT NO. 5.0 14 3.8 21

POSITIVE IMPULSE SUMMARY (PSI-MS)

DAILY AVERAGE	11.0	12.8	12.1	13.1
STD. DEV.	0.92	0.92	0.97	0.60
DAILY VARIANCE	0.85	0.85	0.75	0.36
GRAND AVERAGE AND VARIANCE	12.6 2.51			
VARIANCE BETWEEN GROUPS	...			
VARIANCE WITHIN GROUPS	...			

DAILY MAX. AND SHOT NO. 15.1 25 14.4 1 13.6 24 14.5 1 14.2 22
DAILY MIN. AND SHOT NO. 12.3 18 10.3 7 10.4 16 12.0 25 9.6 6

LOVELACE TEST, MARCH 1979

SUMMARY OF RESULTS: TRANSDUCER 2

DAY 1

DAY 2

DAY 3

DAY 4

DAY 5

ON AXIS --- GRAZING. MAXIMA ARE FROM BOX RECORDS

MAX REC				MAX REC				MAX REC				MAX REC				MAX REC			
ST OVERPRES				ST OVERPRES				ST OVERPRES				ST OVERPRES				ST OVERPRES			
#	PSI	DB	MS	#	PSI	DB	MS	#	PSI	DB	MS	#	PSI	DB	MS	#	PSI	DB	MS
POS				POS				POS				POS				POS			
IMP				IMP				IMP				IMP				IMP			
PSI-MS				PSI-MS				PSI-MS				PSI-MS				PSI-MS			
1	4.5	183.9	70.6	11.1	1	4.7	184.1	69.7	10.5	0	0.0	0.0	0.0	0.0	0.0	1	4.5	183.7	88.4
2	4.5	182.4	74.3	11.2	2	5.4	185.4	67.2	9.4	2	5.1	184.8	68.8	10.2	2	4.3	183.4	75.2	10.7
3	3.8	182.4	82.0	10.6	3	4.0	182.8	67.0	10.1	3	4.9	184.5	75.6	10.6	3	3.7	182.0	67.7	10.7
4	4.0	182.8	67.7	10.7	4	3.5	181.7	80.7	10.1	4	3.8	182.2	201.7	9.8	4	4.3	183.3	67.3	10.9
5	3.9	182.6	174.3	10.7	5	3.9	182.4	80.7	10.0	0	0.0	0.0	0.0	0.0	5	3.9	182.6	70.4	10.9
6	4.2	183.2	82.2	10.9	6	3.8	182.3	67.8	10.3	6	4.1	183.0	201.2	9.7	6	3.8	182.4	92.3	10.6
7	4.5	184.0	67.5	10.7	7	4.7	184.2	67.5	9.8	0	0.0	0.0	0.0	0.0	7	4.2	183.1	86.0	10.9
8	4.0	182.9	67.7	10.9	8	4.5	183.7	67.8	10.2	8	4.1	182.9	0.0	9.8	8	3.7	182.0	67.6	10.5
9	4.2	183.2	67.7	11.0	9	3.2	180.8	80.2	9.4	9	4.3	183.3	67.8	10.1	9	3.9	182.4	89.8	10.5
10	3.8	182.4	72.6	11.0	10	3.4	181.4	67.3	9.9	10	4.5	183.8	57.3	10.2	10	4.0	182.7	68.1	10.8
11	3.5	181.7	85.9	10.5	11	4.2	183.1	66.8	10.3	11	4.5	183.0	80.6	9.5	11	3.5	181.7	86.0	11.1
12	4.2	183.3	68.7	10.9	12	4.3	183.1	67.0	9.5	12	3.2	180.9	201.9	9.6	12	3.9	182.5	69.9	10.8
13	3.9	182.7	67.9	10.5	13	4.1	182.9	67.1	10.1	13	3.7	182.0	103.7	9.7	13	4.2	183.1	68.2	10.9
14	3.5	181.7	68.4	10.9	14	4.5	183.0	67.2	9.4	14	3.5	181.5	80.7	9.2	14	5.2	185.0	40.0	11.1
15	3.8	182.4	68.1	10.9	15	3.8	182.4	67.2	9.5	15	3.4	181.2	201.4	9.4	15	4.2	183.2	85.7	11.0
16	3.8	182.5	70.6	10.4	16	3.6	181.9	68.1	10.1	16	4.1	182.9	84.6	9.9	16	4.9	184.5	69.0	10.7
17	4.1	183.1	74.8	10.7	17	4.0	182.7	84.1	9.9	17	4.4	183.5	56.3	9.9	17	4.4	183.5	67.5	10.6
18	4.7	184.3	137.2	10.8	18	3.4	181.3	67.2	9.6	18	2.9	179.8	80.7	9.5	18	4.0	182.6	68.0	10.6
19	4.4	183.6	68.3	10.7	19	3.8	182.3	67.2	10.3	19	3.8	182.3	74.9	9.4	19	4.4	183.5	82.2	11.1
20	4.0	182.9	67.6	10.7	20	4.1	182.9	67.0	10.0	20	4.5	183.8	67.7	9.7	20	3.6	181.7	86.1	10.8
21	4.4	183.6	67.6	10.9	21	3.1	180.5	142.4	9.9	21	4.6	184.0	68.0	9.8	21	3.8	182.2	68.1	11.2
22	4.3	183.5	67.4	11.1	22	3.1	180.5	69.0	9.6	22	3.8	182.4	90.5	9.6	22	4.0	182.6	89.9	11.1
23	4.0	182.8	55.6	11.0	23	3.3	181.1	67.5	9.3	23	4.2	183.1	68.5	9.8	23	3.8	182.3	67.7	10.8
24	4.0	182.8	173.7	11.3	24	3.7	182.1	67.5	9.8	24	3.7	182.0	89.5	10.0	24	3.8	182.2	68.4	11.0
25	4.1	183.1	68.1	11.4	25	3.6	181.9	66.7	9.9	25	4.1	182.9	67.3	9.4	25	4.0	182.6	68.3	10.8

OVERPRESSURE SUMMARY (PSI)

DAILY AVERAGE	4.1	3.9	4.0	4.1
STD. DEV.	0.30	0.57	0.55	0.39
DAILY VARIANCE	0.09	0.32	0.30	0.16
GRAND AVERAGE AND VARIANCE	4.1 0.26			
VARIANCE BETWEEN GROUPS	0.23			
VARIANCE WITHIN GROUPS	0.26			

DAILY MAX. AND SHOT NO.	4.7	18	5.4	2
DAILY MIN. AND SHOT NO.	3.5	14	3.1	21

5.4	4
3.1	10

POSITIVE IMPULSE SUMMARY (PSI-MS)

DAILY AVERAGE	10.9	9.9	9.8	10.9
STD. DEV.	0.25	0.34	0.33	0.20
DAILY VARIANCE	0.06	0.12	0.11	0.04
GRAND AVERAGE AND VARIANCE	10.2 0.38			
VARIANCE BETWEEN GROUPS	8.80			
VARIANCE WITHIN GROUPS	0.09			

DAILY MAX. AND SHOT NO.	11.4	25	10.5	1
DAILY MIN. AND SHOT NO.	10.4	16	9.3	23

10.6	3
9.2	14

11.2	21
10.5	9

10.4	1
8.9	25

DAY 1

MAX REC	POS	MAX REC	POS
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
41	41	41	41
42	42	42	42
43	43	43	43
44	44	44	44
45	45	45	45
46	46	46	46
47	47	47	47
48	48	48	48
49	49	49	49
50	50	50	50
51	51	51	51
52	52	52	52
53	53	53	53
54	54	54	54
55	55	55	55
56	56	56	56
57	57	57	57
58	58	58	58
59	59	59	59
60	60	60	60
61	61	61	61
62	62	62	62
63	63	63	63
64	64	64	64
65	65	65	65
66	66	66	66
67	67	67	67
68	68	68	68
69	69	69	69
70	70	70	70
71	71	71	71
72	72	72	72
73	73	73	73
74	74	74	74
75	75	75	75
76	76	76	76
77	77	77	77
78	78	78	78
79	79	79	79
80	80	80	80
81	81	81	81
82	82	82	82
83	83	83	83
84	84	84	84
85	85	85	85
86	86	86	86
87	87	87	87
88	88	88	88
89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

DAILY MAX. AND SHOT NO.	14.5	25	13.8	1	14.4	3	15.3	4	13.5	1
DAILY MIN. AND SHOT NO.	13.1	7	11.5	11	12.0	25	13.4	23	12.0	10

DAY 3

DAILY MAX.	AND SHOT NO.	11.5	25	10.3	1	10.7	3	11.4	1	11.0	1
DAILY MIN.	AND SHOT NO.	10.4	17	9.0	14	9.0	22	10.1	10	9.4	10

LOVELACE TEST, MARCH 1979
TRANSDUCER 1
DAY 1

MAXIMA ARE TAKEN FROM THE 40K RECORDS
ON AXIS --- FACE-UN

ESTIMATED MAXIMA										IMPULSES								BASE LINE CHECKS			
SHOT	MAX REC PSI	MIN PSI	THIN* MS	EI PSI	SO PSI	LST PSI	AVE PSI	DEV PSI	MAX1 PSI	TI MS	ADUR MS	HOUR MS	TOTAL PUS	DRIFT	SD	BASE*					
1	6.5	-1.2	16.18*	6.9	4.7	4.4	0.18*	0.18*	6.5	0.03	7.1	68.2	*-6.69	12.75*	0.00	0.01	0.00*				
2	5.2	-1.1	13.70*	5.4	4.0	3.7	0.28*	0.28*	5.2	0.05	7.6	71.0	*-1.55	14.16*	0.00	0.03	0.00*				
3	5.4	-1.1	15.63*	5.6	4.3	4.1	0.28*	0.28*	5.4	0.03	7.7	68.1	*2.14	13.42*	0.00	0.03	0.00*				
4	6.0	-1.1	15.05*	6.4	4.4	4.0	0.18*	0.18*	6.0	0.03	7.4	67.4	*-1.82	13.82*	0.00	0.01	0.00*				
5	5.6	-1.0	13.93*	5.9	4.1	3.8	0.18*	0.18*	5.6	0.03	7.5	66.8	*-1.02	13.50*	0.00	0.00	0.00*				
6	5.8	-1.2	15.57*	5.9	4.7	4.3	0.28*	0.28*	5.8	0.05	7.5	66.0	*-3.84	13.92*	0.00	0.03	0.00*				
7	6.6	-1.0	15.82*	7.0	5.1	4.8	0.18*	0.18*	6.6	0.03	8.0	37.4	*2.28	13.60*	0.00	0.01	0.00*				
8	5.4	-1.0	14.98*	5.6	4.4	4.1	0.28*	0.28*	5.4	0.05	9.7	67.9	*2.37	14.18*	0.00	0.01	0.00*				
9	5.7	-1.1	14.40*	5.7	4.3	4.0	0.28*	0.28*	5.7	0.05	7.2	67.4	*-2.23	13.74*	0.00	0.02	0.00*				
10	5.3	-1.0	15.57*	5.5	4.3	4.0	0.28*	0.28*	5.3	0.05	7.8	72.6	*-1.74	13.49*	0.00	0.00	0.00*				
11	5.2	-1.1	15.13*	5.5	3.7	3.3	0.28*	0.28*	5.2	0.03	8.0	55.5	*-0.90	13.53*	0.00	0.00	0.00*				
12	5.8	-1.2	15.23*	5.9	4.6	4.4	0.18*	0.18*	5.8	0.05	8.1	68.6	*-6.79	12.77*	0.00	0.03	0.00*				
13	5.3	-1.1	13.53*	5.4	4.4	4.1	0.28*	0.28*	5.3	0.05	8.0	68.1	*-2.70	12.69*	0.00	0.04	0.00*				
14	5.0	-1.2	14.90*	5.1	3.8	3.6	0.09*	0.09*	5.0	0.05	8.0	68.3	*-3.36	13.29*	0.00	0.01	0.00*				
15	5.7	-1.2	14.93*	6.2	4.5	4.2	0.18*	0.18*	5.7	0.03	7.2	68.1	*-4.38	12.93*	0.00	0.03	0.00*				
16	5.7	-1.1	15.93*	6.0	4.1	3.9	0.18*	0.18*	5.7	0.03	8.0	70.6	*-3.28	13.01*	0.00	0.02	0.00*				
17	6.1	-1.1	27.55*	6.4	4.3	4.0	0.18*	0.18*	6.1	0.03	7.4	67.6	*-8.79	12.72*	0.00	0.02	0.00*				
18	6.7	-1.3	15.03*	7.0	4.6	4.5	0.18*	0.18*	6.7	0.03	7.3	41.4	*-7.76	12.26*	0.00	0.02	0.00*				
19	5.2	-1.2	15.60*	5.8	4.4	4.3	0.09*	0.09*	5.2	0.05	8.0	68.3	*-2.11	0.00*	0.00	0.02	0.00*				
20	5.8	-1.1	13.95*	6.1	4.4	4.1	0.28*	0.28*	5.8	0.05	8.1	67.5	*-0.26	13.21*	0.00	0.04	0.00*				
21	6.4	-1.0	13.85*	6.8	4.8	4.5	0.28*	0.28*	6.4	0.03	7.5	67.0	*0.28	13.85*	0.00	0.03	0.00*				
22	5.7	-1.0	14.80*	6.0	4.0	3.7	0.28*	0.28*	5.7	0.03	7.1	66.6	*-1.35	14.81*	0.00	0.00	0.00*				
23	5.7	-1.1	15.05*	6.1	4.3	4.1	0.18*	0.18*	5.7	0.03	7.4	67.5	*-1.38	13.91*	0.00	0.04	0.00*				
24	5.0	-1.0	15.00*	5.2	4.7	4.3	0.28*	0.28*	5.0	0.05	7.5	67.6	*8.25	14.32*	0.00	0.02	0.00*				
25	6.0	-1.1	14.80*	6.3	4.5	4.3	0.18*	0.18*	6.0	0.03	9.1	67.8	*2.03	15.06*	0.00	0.01	0.00*				

SECTION C

CORRELATION STUDIES:

M-198 REPRODUCIBILITY (30 NOV 78 TEST)
SHOCK TUBE REPRODUCIBILITY CORRELATIONS
BETWEEN SHOCK TUBE AND M-198

CORRELATION STUDY.

CONTENTS:

I. INTRODUCTION

II. APPROACH CORRELATIONS.

- II.1. SHOT-SHOT CORRELATIONS AT THE SAME LOCATION.
- II.2. COMPARISONS OF ENSEMBLE AVERAGES AT DIFFERENT LOCATIONS.

III. TOWELACE CORRELATIONS.

- III.1. SHOT-SHOT CORRELATIONS.
- III.2. ENSEMBLE CORRELATIONS.
- III.3. STUDY OF RECORD DURATIONS.

IV. TOWELACE-APPROACH CORRELATIONS.

- IV.1. EFFECTS OF DEVIATION.
- IV.2. COMPARISONS.

1. DEFINITIONS.

1.1. $X(I)$, 1-LEN FOR A RECORD. THE AVERAGE IS $AVE=(1/N)SUM(X(I))$.
 THE STANDARD DEVIATION IS $SD=((1/N)SUM(X(I)-AVE)**2)**1/2$.
 THE NORMALIZED BREADTH IS $BRLW=(1/N)SUM(X(I)-AVE)**3/SD**3(3/2)$.
 THE NORMALIZED WIDTH IS $WRT=(1/N)SUM(X(I)-AVE)**4/SD**4$.

THE CORRELATION COEFFICIENT BETWEEN TWO RECORDS OF EQUAL LENGTH IS
 $COR=(1/N)SUM(X(I)-XAVL)*(Y(I)-YAVE)/((XSD*YSD))$.

II. COMPARISON OF SHOTS AT APPROACH

II.1 SHOT SHOT CORRELATION AT SAME LOCATION.

NOTICE IS THE POINT WHERE THE RECORDS LINE UP FOR MAX. CORRELATION.
 THE RECORDS ARE COMPARED FOR 150MS STARTING APPROX. 2.5MS
 BEFORE THE PULSE, (EXCEPT FOR THE C-22 AZ330,0000 RECORDS
 WHICH BEGIN 10MS BEFORE PULSE AND LAST 150MS).

AVE IS THE AVERAGE (MEAN) OF THE RECORD.

SD IS THE STANDARD DEVIATION OF THE RECORD.

BRLW IS THE NORMALIZED BREADTH OF THE RECORD.

WRT IS THE NORMALIZED WIDTH OF THE RECORD.

COR LISTS THE CORRELATION COEFFICIENT BETWEEN THE SHOT NUMBERS LISTED.
 LOC GIVES LOCATION-HEIGHT-AZIMUTH-QUADRANT ELEVATION.

ALL SHOTS ARE GRAZING.

NORMALIZED AT 0K, NO FILTER.

HATCH	NOV	SH	SNLW	NOET	COR	LOC
2/0	-.00467	.316	2.42	17.2	30,311 .913	C-22,3',0,000
167	-.00430	.321	2.39	18.5	30,321 .908	130-32 TRANS 1
317	-.00469	.321	2.35	10.2	31,321 .007	
106	.00191	.365	2.03	22.3	14,151 .947	C-22,3',0,267
322	-.00122	.363	2.90	22.7	14,171 .947	114-17 TRANS 1
306	.00401	.361	3.00	23.3	15,171 .940	
302	.00063	.419	2.10	15.0	51,521 .919	C-22,3',330,267
320	-.00300	.419	2.02	16.2	51,531 .910	151-53 TRANS 1
313	.00610	.401	2.24	15.6	52,531 .917	
307	.0277	.347	2.30	16.9	40,491 .921	C-22,3',330,800
319	-.0153	.351	1.05	14.7	40,501 .090	140-50 TRANS 1
328	-.0129	.340	2.30	17.7	49,501 .906	
322	.0125	.294	2.37	19.1	30,311 .910	C-22,4',0,000
161	.0220	.205	2.13	17.3	30,321 .902	130-32 TRANS 2
312	.0122	.299	2.15	17.0	31,321 .921	
104	-.0165	.350	2.19	18.2	14,151 .930	C-22,4',0,267
320	.00230	.341	2.64	20.0	14,171 .930	114-17 TRANS 2
304	.00726	.341	2.57	18.6	15,171 .935	
399	-.0163	.411	1.05	15.4	51,521 .916	C-22,4',330,267
310	-.0137	.416	2.11	17.1	51,531 .922	151-53 TRANS 2
311	-.00307	.414	2.31	18.0	52,531 .922	
302	-.0274	.345	2.06	18.2	40,491 .906	C-22,4',330,800
313	-.0319	.328	1.01	16.7	40,501 .000	140-50 TRANS 2
392	.0350	.335	2.20	17.2	49,501 .095	
327	.00124	.307	2.80	21.5	30,311 .922	C-22,5',0,000
156	.00126	.293	2.25	20.2	30,321 .915	130-32 TRANS 3
307	.00310	.301	2.17	18.9	31,321 .911	
102	.00390	.406	2.41	19.3	14,151 .039	C-22,5',0,267
310	-.00602	.411	1.62	17.5	14,171 .054	114-17 TRANS 3
302	-.0576	.410	1.97	10.1	15,171 .055	TRANS. QUESTION
398	.00001	.306	2.07	16.6	51,521 .913	C-22,5',330,267
316	.0293	.396	1.96	15.9	51,531 .913	151-53 TRANS 3
409	.0101	.305	1.96	15.3	52,531 .912	
377	-.00044	.300	1.94	10.0	40,491 .000	C-22,5',330,800
300	.00029	.313	1.04	16.3	40,501 .006	140-50 TRANS 3
307	-.00740	.315	2.37	17.7	49,501 .000	
363	.00413	.273	2.52	21.6	30,311 .907	C-22,6',0,000
151	.0110	.273	2.54	21.8	30,321 .913	130-32 TRANS 4
302	-.00166	.267	2.42	21.5	31,321 .907	
101	-.00259	.295	1.01	17.1	14,151 .920	C-22,6',0,267
317	-.00074	.293	2.03	10.5	14,171 .904	114-17 TRANS 4
301	-.00040	.294	2.34	10.9	15,171 .920	
396	.00640	.374	2.20	10.4	51,521 .922	C-22,6',330,267
315	.00041	.365	1.63	13.9	51,531 .907	151-53 TRANS 4
300	.00231	.344	1.64	14.3	52,531 .903	

11.2 CORRELATION AT DIFFERENT LOCATIONS.

C22,0,267	3'	4'	5'	6'
		.905	.702	.831
	4'		.830	.090
	5'			.046

C22,0,267,4'	WITH C22,0,800,4'1	.763
C22,0,267,4'	WITH C22,330,267,4'1	.873
C22,0,800,4'	WITH C22,330,267,4'1	.697

11.3. 10VOLTAGE CORRELATIONS.

111.1 SHOT-SHOT CORRELATIONS.

DIGITIZER AT 80K WITH 20K PREFILTER.

RECORD BEGINS 1 MS BEFORE PULSE AND LASTS 150 MS.

DAY 1. TRANSDUCER 2. GRAZING, DIRECTLY IN FRONT OF THE SHOCK TUBE

SHOT	SHL4	NR4
1	3.68	26.1
2	3.41	21.0
3	3.97	27.4
4	3.05	25.7
5	4.16	28.2
6	4.01	28.5
8	3.73	25.3
9	4.25	29.2
13	3.60	25.4
15	3.91	26.9
16	3.77	25.4
17	3.40	23.1
18	3.52	24.4
19	3.60	25.2
20	3.69	25.0
21	3.91	26.8
22	4.23	29.2
23	3.75	24.0
24	3.87	26.0

III.2 COMPARISON OF ENSEMBLE AVERAGES.

FOR EACH 1ST DAY AT LOVELACE THREE SHOTS WERE CHOSEN FROM THE TRANSDUCER 2 RECORD. FOR DAYS 1 AND 4

THE THREE SHOTS WERE CHOSEN TO HAVE HIGH CORRELATION WITH EACH OTHER (SEE ABOVE). FOR THE OTHER DAYS THE

THREE SHOTS WERE CHOSEN BY PICKING THOSE WITH SIMILAR MAX PULSES, D-DURATIONS, ETC. THEY WERE THEN CORRELATED

TO FIND THE BEST MATCHING POINT.

THE SHOTS CHOSEN WERE: DAY 1 04,15,24
DAY 2 03,13,20
DAY 3 10,21,25
DAY 4 03,15,22
DAY 5 06,16,21

CORRELATION IN ORIENTATION

DAY 2:	SNOW	MURF	CORRELATION
03	3.94	29.2	03,131 .902
13	3.65	27.1	03,201 .933
20	3.39	23.9	13,201 .924

DAY 3:	SNOW	MURF	CORRELATION
10	3.40	25.1	10,211 .072
21	3.99	29.7	10,251 .082
25	3.97	20.7	21,251 .927

DAY 5:	SNOW	MURF	CORRELATION
06	4.05	32.3	06,161 .039
16	4.14	31.1	06,211 .034
21	3.60	24.0	16,211 .914

THE ENSEMBLE AVERAGE OF THE THREE SHOTS WAS TAKEN BY LINING THEM UP FOR HIGHEST CORRELATION. THE ENSEMBLE AVERAGE BEGINS APPROXIMATELY 1 MS BEFORE THE PULSE AND LASTS 150 MS. THE 00A RECORDS WERE USED.

CORRELATION BETWEEN ENSEMBLE AVERAGES OF THE DIFFERENT DAYS.

DAY	SNOW	MURF
1	4.04	27.7
2	3.07	20.7
3	4.12	30.7
4	4.23	29.2
5	4.26	32.6

DAY	1	2	3	5
2	.959			
3	.955	.959		
4	.954	.920	.945	
5	.950	.939	.962	.943

CORRELATION OF SHOTS 04,15,24 OF DAY 1 AND THE ENSEMBLE AVE. OF DAY 1.

04,AVE: .901
15,AVE: .979
24,AVE: .984

III.3 RECORD LENGTH COMPARISON.

FOR THE PRELIMINARY RECORD LENGTHS 150HS,75HS,37.SHS.

DAY 1 TRANS 2 SHOTS 04,15,24

COR GIVES COMPARISON OF 4,15 4,24 15,24 IN THAT ORDER.

	150HS			75HS			37.SHS		
	SKEW	KURT	COR	SKEW	KURT	COR	SKEW	KURT	COR
04	3.05	25.7	.936	2.95	14.3	.948	2.17	7.72	.968
15	3.91	26.9	.951	3.03	15.1	.965	2.20	8.36	.978
24	3.07	26.0		2.95	14.4	.956	2.20	7.83	.977

IV. LOVELACE - ARKDEEN COMPARISON

IV.1 EFFECTS OF DECIMATION.

THE LOVELACE DATA OF THE MARCH 1979 TEST WAS DIGITIZED AT 80 KHZ WITH A 20KHZ PREFILTER.

THE ARKDEEN DATA OF NOV 30 - DEC 1 1970 TEST WAS DIGITIZED AT 0 KHZ WITH NO PREFILTER.

CONSEQUENTLY, THE LOVELACE DATA MUST BE DECIMATED FOR COMPARISON.

THE ENSEMBLE AVERAGE OF DAY 1 TRANSDUCER 2 WAS DECIMATED FROM 80 KHZ TO 0 KHZ BY TAPING EVERY 10TH POINT. THERE ARE THUS 10 DIFFERENT RECORDS DEPENDENT ON WHICH POINT IS USED AS THE STARTING POINT.

ST. FT.	BOOK 75MS REC. AVE	STARTING 2.5MS PREPULSE SKEW	BOOK 150MS RECOND. AVE	2.5MS SKEW	PRE KURT
01	3.07	24.3	3.08	15.4	28.0
02	3.02	24.2	3.06	15.2	27.6
03	3.11	24.3	3.02	14.7	26.8
04	3.17	24.9	3.14	15.7	28.7
05	3.14	24.8	3.12	15.5	28.4
06	3.08	24.5	3.05	15.0	27.3
07	3.09	24.4	3.03	14.8	27.0
08	3.11	24.4	3.05	15.0	27.3
09	3.11	24.5	3.07	15.2	27.7
10	3.09	24.4	3.09	15.4	28.0

EACH BOOK RECORD PROVIDES 10 BK SUBRECORDS TO COMPARE WITH THE BK AVERAGE DATA. BY CORRELATING EACH OF THESE TEN RECORDS WITH THE AVERAGE RECORD A TIME MISMATCH OF NO MORE THAN 6.25 MICROSECONDS CAN BE ACHIEVED.

THE TEN RECORDS OF THE ENSEMBLE AVE. OF DAY 1 TRANSDUCER 2 WERE CORRELATED WITH THE AVERAGE ENSEMBLE AVERAGES!

RECORD LENGTH 15MS. STARTING 2.5 MS PREPULSE.

	1	2	3	4	5	6	7	8	9	10
022.0.267.4'	.756	.762	.772	.774	.779	.769	.766	.767	.772	.765
022.0.267.4'	.800	.801	.799	.802	.802	.801	.801	.801	.802	.801
022.0.000.4'	.786	.787	.786	.789	.788	.787	.787	.787	.787	.786
030.0.267.4'	.816	.815	.817	.816	.817	.817	.817	.817	.817	.817

RECORD LENGTH 75MS. STARTING 2.5MS PREPULSE.

	1	2	3	4	5	6	7	8	9	10
022.0.267.4'	.810	.819	.817	.819	.819	.818	.818	.818	.819	.819
022.0.000.4'	.803	.804	.802	.805	.805	.804	.803	.804	.803	.803
030.0.000.4'	.829	.829	.829	.830	.829	.829	.829	.829	.829	.828
030.0.267.4'	.835	.835	.836	.835	.836	.836	.836	.836	.836	.836

IV.2 CORRELATIONS OF LOVELACE AND AMERDEEN.
 THE HIGHEST CORRELATION IS LISTED. THIS IS OBTAINED BY
 CHOOSING THE BEST OF THE 10 DOK DECIMATED RECORDS. IN SOME
 CASES ONLY THREE OF THE TOTAL OF 10 WERE LOOKED AT AS THE
 CORRELATION DOES NOT VARY MUCH.
 THE SKEW AND KURT OF THE LOVELACE ENSEMBLES IS THE AVE OF THE
 DECIMATED RECORDS USED.

150 MS RECORDS STARTING 2.5 MS PREPULSE.

DAY 1 TRANS. 2	COR	SKEW	KURT
C22,0,267,4	.78	4.0	20.
C22,0,267,4	.80	2.2	16.
C22,0,267,4	.79	2.6	19.
C22,0,800,4	.79	2.4	19.
C30,0,800,4	.81	2.4	18.
C30,0,267,4	.82	2.3	16.
DAY 2 TRANS. 2			
C22,0,267,4	.79	3.9	29.
		2.6	19.
DAY 3 TRANS. 2			
C22,0,267,4	.81	4.2	31.
C30,0,800,4	.83	2.6	19.
C30,0,267,4	.82	2.4	18.
		2.3	16.
DAY 4 TRANS. 2			
C22,0,267,4	.81	4.2	29.
C22,0,800,4	.81	2.6	19.
		2.4	19.
DAY 5 TRANS. 2			
C22,0,267,4	.81	4.3	33.
		2.6	19.
DAY 5 TRANS. 4			
C22,0,267,4	.80	3.9	35.
C22,0,800,4	.75	2.6	19.
C30,0,800,4	.77	2.4	19.
C30,0,267,4	.82	2.4	18.
		2.3	16.

75 MS RECHRD STARTING 2.5 MS PREPULSE.

DAY 1 TRANS 2	COR.	SEW.	ADRT.
022,0,267,4'	.02	3.1	15.
022,0,400,4'	.00	2.0	10.
030,0,400,4'	.03	1.0	10.
030,0,267,4'	.04	1.7	9.0
022,0,267,3'	.70	2.3	12.
022,0,267,5'	.76	2.0	11.
022,0,267,6'	.02	1.7	9.7
DAY 3 TRANS. 2			
022,0,267,3'	.77	3.2	17.
022,0,400,4'	.01	2.3	12.
030,0,400,4'	.04	1.0	10.
030,0,267,4'	.03	1.0	9.0
DAY 5 TRANS. 2			
022,0,267,3'	.77	3.4	19.
022,0,400,4'	.02	2.3	12.
030,0,400,4'	.06	1.0	10.
030,0,267,4'	.04	1.0	9.0
DAY 5 TRANS. 4			
022,0,267,4'	.03	3.2	15.
022,0,400,4'	.78	2.0	10.
030,0,400,4'	.00	1.0	10.
030,0,267,4'	.04	1.0	9.0
		1.7	0.4

SECTION D
DYNAMIC PRESSURE STUDY

DYNAMIC PRESSURE.

ACCORDING TO THEORY (THE EFFECTS OF NUCLEAR WEAPONS, S. GLASSTONE ET AL., APRIL 1962, SEC. 4.62-4.101) WHEN A SHOCK WAVE HITS A FLAT SURFACE HEAD-ON A REFLECTED WAVE IS PRODUCED. THIS WAVE LASTS UNTIL A RAREFACTION WAVE PASSES OVER THE SURFACE FROM THE EDGES OF THE SURFACE. FOR THE 61-2 TRANSDUCER THE REFLECTED SPIKE SHOULD LAST ABOUT 25 MICROSECONDS. AFTER ITS PASSAGE THE PRESSURE AT THE SURFACE (AWAY FROM THE EDGES) IS SUPPOSED TO BE APPROXIMATELY THE GRAZING PRESSURE PLUS THE DYNAMIC PRESSURE.

SINCE THE LOVELACE DATA WAS FILTERED THE REFLECTED SPIKE ON THE HEAD-ON TRANSDUCERS (11 & 13) IS REDUCED IN THE PEAK RECORDED PRESSURE IS NOT THE REFLECTED PRESSURE.

SINCE NOT ALL OF THE PEAK WAS FILTERED OUT AN EXTRAPOLATION PROCEDURE MUST BE USED TO RECOVER THE PEAK DYNAMIC PRESSURE.

THE VARIABILITY OF THE RECORDS MAKES THIS DIFFICULT. IT IS RECOMMENDED THAT THE RECORDS BE DIGITIZED AT A HIGHER RATE FOR A MORE ACCURATE EXTRAPOLATION.

FOR AN APPROXIMATE RESULT THE LEAST SQUARES MAXIMA (SEE THE 1 DAY SUMMARIES) WERE USED FOR THE HEAD-ON GAUGE 1 AND THE CORRESPONDING GRAZING GAUGE 2.

THE RESULTS ARE AS FOLLOWS:

AVERAGE LEAST SQUARES MAXIMA (PSI).

	DAY1	DAY2	DAY3	DAY4	DAYS
GAUGE 1	4.4	4.4	4.4	4.4	4.5
GAUGE 2	4.0	3.6	3.7	3.9	3.7
EXTX. DYN. PEAK	0.4	0.8	0.7	0.5	0.8

A MORE ACCURATE ESTIMATION OF THE DYNAMIC PRESSURE WOULD BE ITS IMPULSE OBTAINED BY SUBTRACTION OF THE POSITIVE IMPULSES OF THE CORRESPONDING GAUGES.

AVERAGE DAILY POSITIVE IMPULSES (PSI-MS).

	DAY1	DAY2	DAY3	DAY4	DAYS
GAUGE 1	11.6	11.1	10.6	11.8	10.9
GAUGE 2	9.5	8.8	8.6	9.6	8.6
EXTX. DYN. IMP.	2.1	2.3	2.0	2.2	2.3
GAUGE 3	---	10.9	11.3	12.0	11.3
GAUGE 4	9.9	8.6	9.0	10.1	9.3
EXTX. DYN. IMP.	---	2.3	2.3	2.7	2.0

THREE SETS OF ENSEMBLE AVERAGES WERE MADE. DAY 4 GAGES 1 & 2
WERE CHOSEN.

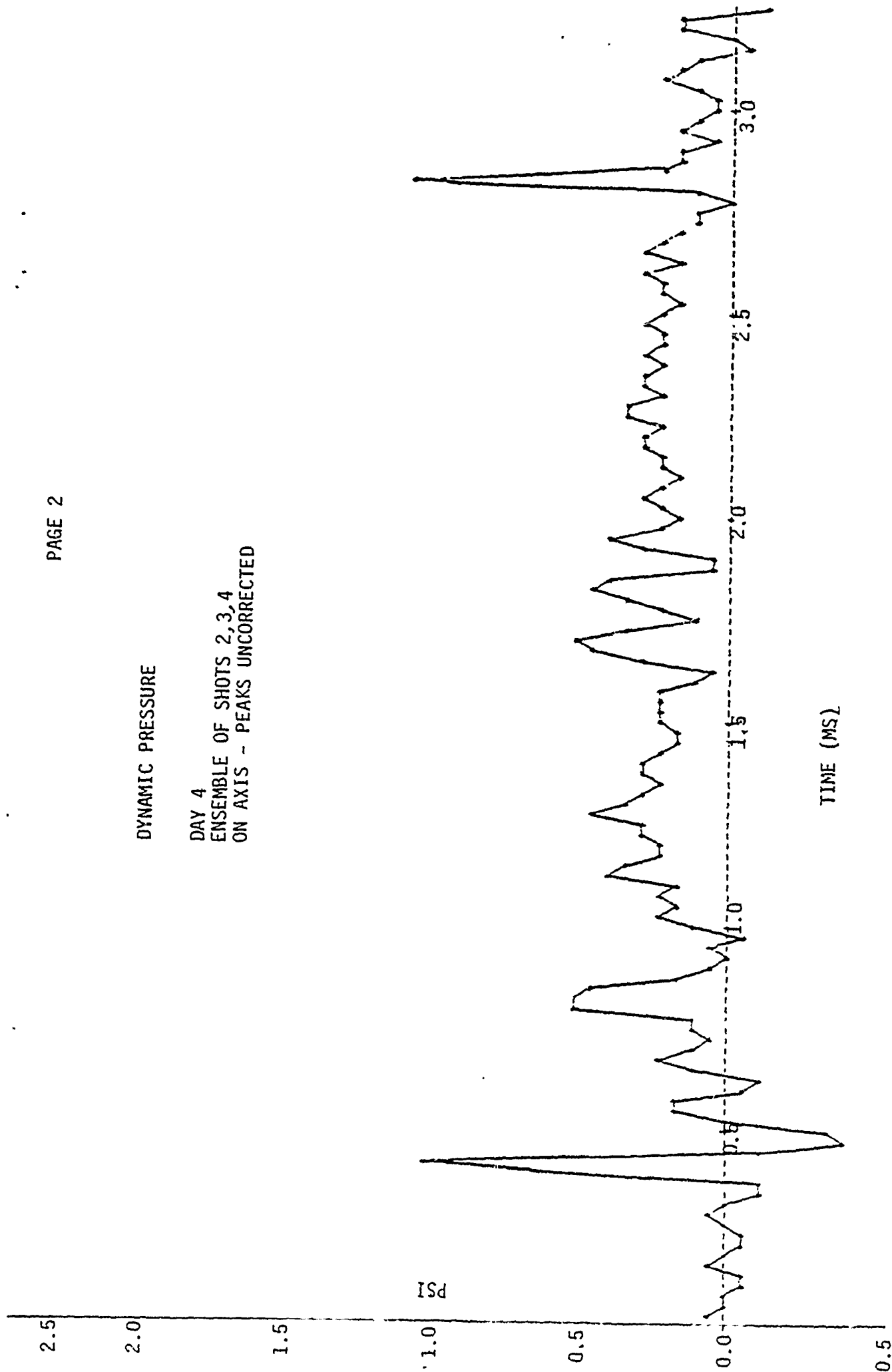
ENSEMBLE 11 SHOTS 2,3,4
ENSEMBLE 12 SHOTS 5,6,7
ENSEMBLE 13 SHOTS 8,9,10

THEIR DIFFERENCES WERE TAKEN TO GIVE PLOTS OF THE DYNAMIC PRESSURES.

PAGE 2

DYNAMIC PRESSURE

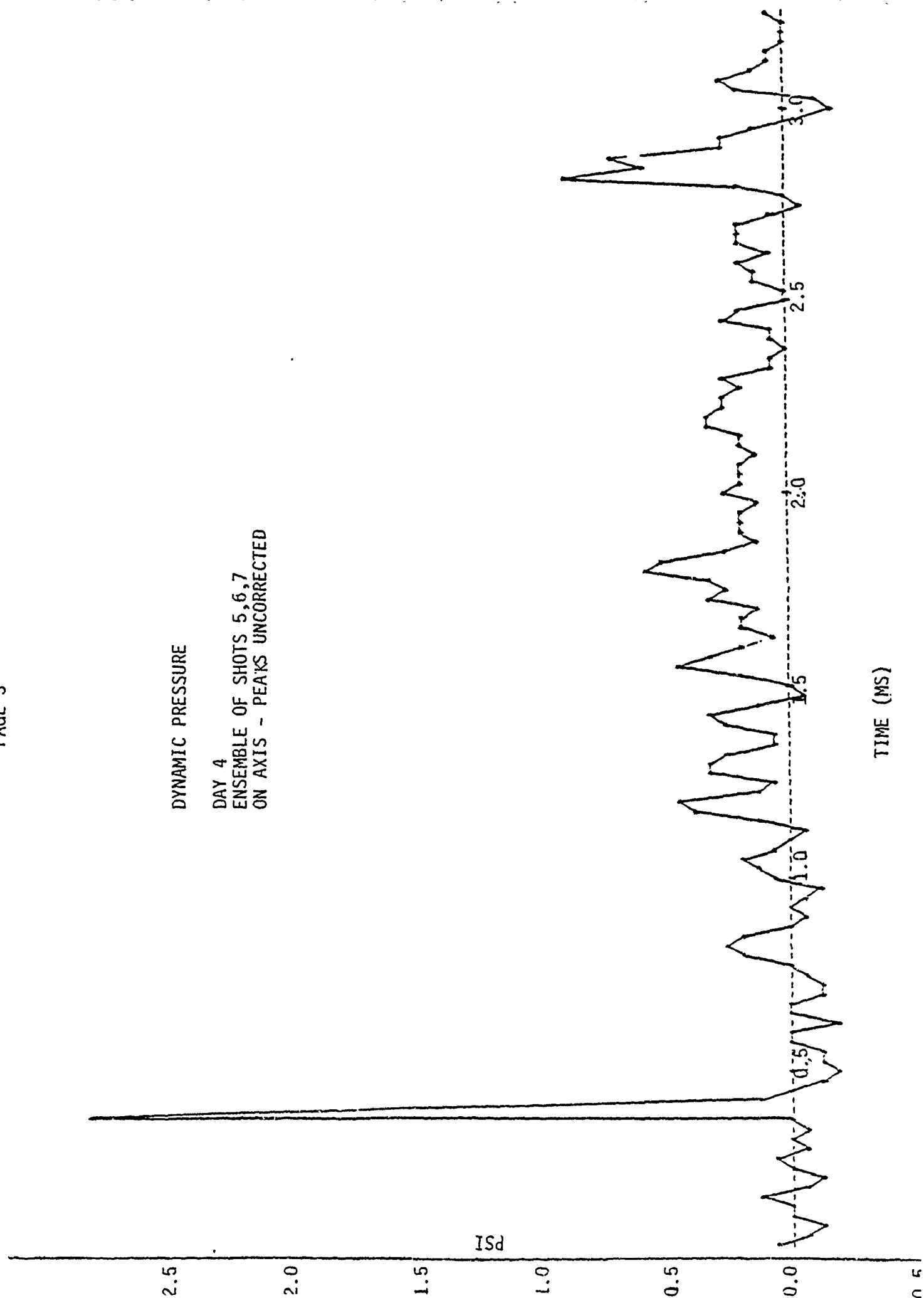
DAY 4
ENSEMBLE OF SHOTS 2,3,4
ON AXIS - PEAKS UNCORRECTED



PAGE 3

DYNAMIC PRESSURE

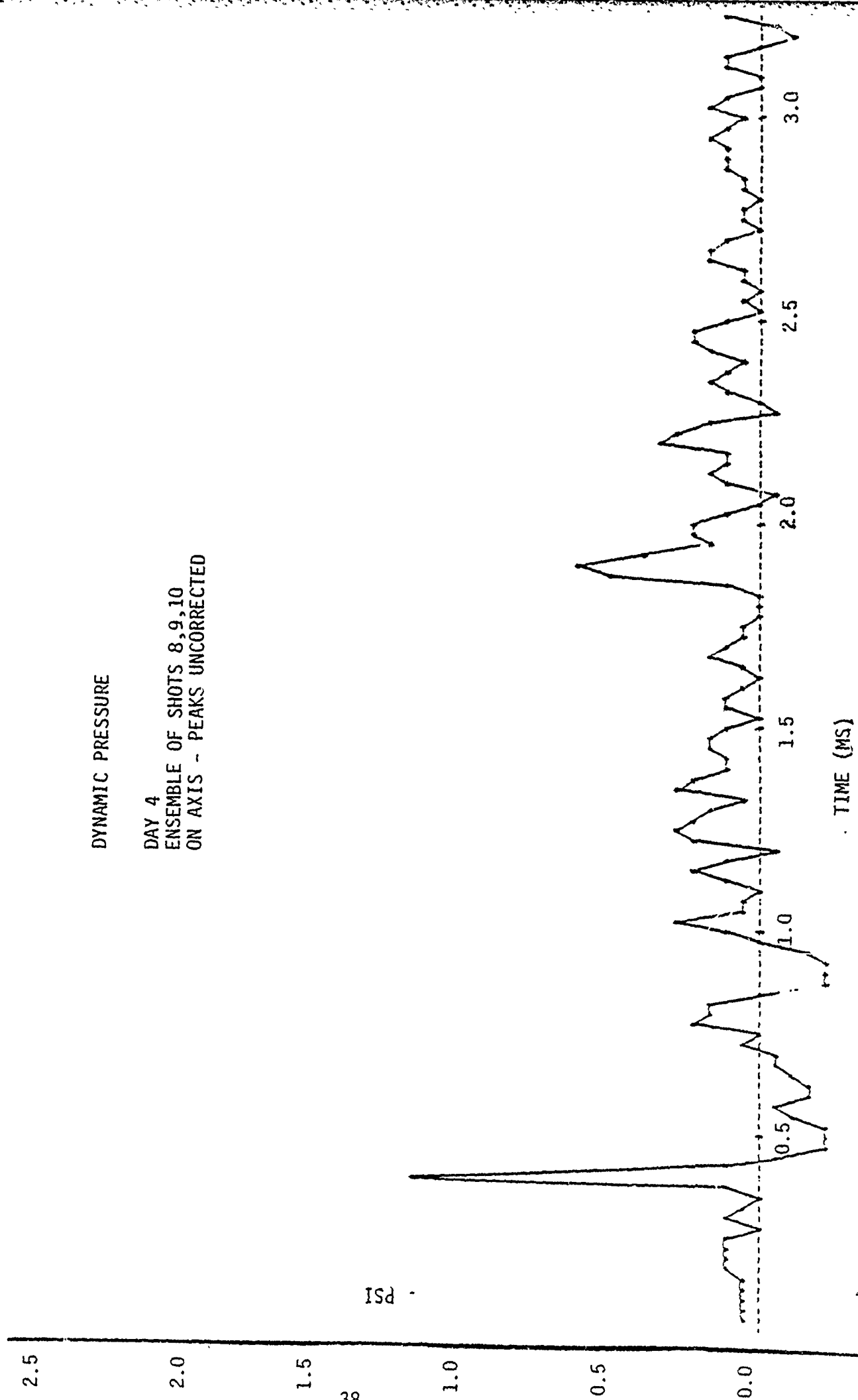
DAY 4
ENSEMBLE OF SHOTS 5,6,7
ON AXIS - PEAKS UNCORRECTED



PAGE 4

DYNAMIC PRESSURE

DAY 4
ENSEMBLE OF SHOTS 8,9,10
ON AXIS - PEAKS UNCORRECTED



SECTION E

1 DAY SUMMARY DATA

1 DAY SUMMARY DATA.

MAX IS C IS THE MAXIMUM RECORDED OVERPRESSURE(P-SI).
 MIN/THIN ARE THE MINIMUM RECORDED PRESSURE (PSI) AND THE TIME AT
 WHICH IT OCCURS AFTER THE ARRIVAL OF THE PULSE (MS)

ESTIMATED MAXIMUM

F1 IS ESTIMATION OF THE ACTUAL ANALOG MAXIMUM AT THE
 INITIAL PULSE (F1) . IF THE SIGNAL
 IS UNQUALIFIED AND SAMPLED AT TWICE THE CUTOFF FREQ (OR HIGHER)
 THEN THE EXACT ANALOG TIME-HISTORY CAN BE RECOVERED VIA
 $F1 = \text{SUM}(F(N) * \text{SINC}(X) / X)$ WHERE $X = P1E * (1 / FAC - K)$ IF AC-TIME BETWEEN
 POINTS; AND THE SUM IS OVER N. THE CURRENT ALGORITHM USES 50
 POINTS IN THE SUMMATION AND SEARCHES A 5 POINT REGION IN 100 STEPS

F1ST 50 MAX, LST 50 AVE, STD DEV ARE ESTIMATES WHICH ATTEMPT TO
 CORRECT FOR THE FIRST RISE TIME OF THE TRANSDUCER AND/OR OVER-
 SHOOT. NINE DIFFERENT LINES OF VARYING LENGTH AND STARTING
 POINT ARE FIT TO THE DECAY OF THE INITIAL PULSE. THE LARGEST
 PRESSURE RESIDUUM IS LST 50 MAX; THE AVERAGE OF THE NINE IS
 LST 50 AVE AND STD DEV IS THE STANDARD DEVIATION.

MAX1,11 ARE THE LARGEST RECORDED PRESSURE IN THE FIRST MILLI-
 SEC AFTER PULSE ARRIVAL
 F1 IS THE RESPECTIVE TIME RELATIVE
 TO INITIAL ARRIVAL

AARRK,DDUR ARE THE A-DURATION AND D-DURATION (AFTER PROPOSED MIL-STD)
 (MS).

INPUTS

TOTAL-PUB (F51-MS). TOTAL IS THE SUM OF THE PRESSURES IN
 THE RECORD. POS IS THE SUM OF THE PRESSURES FROM THE ARRIVAL
 OF THE PULSE UNTIL THE FIRST TIME THE RECORD REACHES ZERO AFTER THE "REFLECTED PULSE".

BASE LINE CHECKS

BRT THE BASE LINE IS FITTED WITH A LEAST SQUARES LINE FOR
 ONE MS BEFORE THE PULSE ARRIVAL. DRIFT IS THE SLOPE OF THE FITTED
 LINE

SD IS THE SAMPLE STANDARD DEVIATION OF THE PRE-PULSE RECORD.
 BASEL IS THE TIME INTERVAL IN MS FROM THE PULSE ARRIVAL TO THE
 LAST POINT BEFORE ARRIVAL WHERE THE PRESSURE EXCEEDED 5% OF THE
 DIFFERENCE BETWEEN THE MAX. PRESSURE AND THE MINIMUM. BAS=0
 INDICATES NO PREPULSE PRESSURE EXCEEDED THE CRITERION. BAS=999
 INDICATES THE PROGRAM MADE A BAD CHOICE FOR THE ARRIVAL POINT.

LOVELACE TEST, MARCH 1979
TRANSDUCER 1
DAY 2

MAXIMA ARE TAKEN FROM THE 40K RECORDS
ON AXIS --- FACE-ON

ESTIMATED MAXIMA										IMPULSES					BASE LINE CHECKS				
SHOT	REC	MAX	THIN	PSI	PSI	PSI	PSI	PSI	PSI	DEV	MAX	T1	ADUR	HDUR	TOTAL	POS	DRIFT	SD	BASE
	PSI	PSI	MS	MS	MS	MS	MS	MS	MS	MS	PSI	MS	MS	MS	MS	MS	MS	MS	MS
1	7.1	-1.3	13.80	7.3	5.4	5.1	0.22	7.1	0.05	7.6	69.5	7.6	69.5	MS	-4.09	14.42	0.00	0.09	1.18
2	8.8	-1.2	15.55	9.3	6.2	5.7	0.33	8.8	0.03	7.5	38.5	7.5	38.5	MS	-4.76	12.64	0.00	0.04	0.00
3	4.8	-1.2	14.80	5.6	4.9	4.7	0.22	4.8	0.03	7.7	83.1	7.7	83.1	MS	-3.09	13.96	0.00	0.05	0.00
4	5.3	-1.2	14.70	5.5	4.5	4.3	0.11	5.3	0.05	7.5	81.0	7.5	81.0	MS	-5.73	13.32	0.00	0.05	0.00
5	6.5	-1.4	14.90	6.9	4.9	4.6	0.11	6.5	0.03	7.5	67.0	7.5	67.0	MS	-8.43	12.17	0.00	0.04	0.00
6	6.3	-1.3	14.93	6.7	4.2	3.8	0.22	6.3	0.03	7.5	67.7	7.5	67.7	MS	-4.56	13.45	0.00	0.03	0.00
7	7.3	-1.4	15.03	7.8	5.1	4.7	0.22	7.3	0.03	7.0	46.6	7.0	46.6	MS	-18.45	10.30	0.00	0.05	0.00
8	6.9	-1.4	15.05	7.3	4.8	4.6	0.22	6.9	0.03	7.3	67.9	7.3	67.9	MS	-11.27	12.63	0.00	0.05	0.00
9	4.7	-1.3	15.07	4.9	4.0	3.8	0.11	4.7	0.05	7.3	176.7	7.3	176.7	MS	-21.37	11.38	0.00	0.04	0.00
10	4.7	-1.3	15.80	5.0	3.8	3.7	0.11	4.7	0.03	7.6	166.6	7.6	166.6	MS	-20.59	12.42	0.00	0.03	0.00
11	6.5	-1.5	15.00	6.8	4.5	4.2	0.22	6.5	0.03	7.3	52.4	7.3	52.4	MS	-15.78	11.39	0.00	0.07	0.00
12	6.7	-1.3	15.30	6.9	4.5	4.2	0.22	6.7	0.05	8.0	45.9	8.0	45.9	MS	-11.52	11.64	0.00	0.05	0.00
13	6.2	-1.2	15.75	6.2	4.8	4.6	0.22	6.2	0.05	8.1	67.0	8.1	67.0	MS	-1.11	13.51	0.00	0.05	0.00
14	7.8	-1.2	15.35	8.3	5.4	5.0	0.22	7.8	0.03	7.8	66.8	7.8	66.8	MS	-2.17	13.02	0.00	0.04	0.00
15	6.3	-1.3	15.43	6.6	4.3	4.1	0.22	6.3	0.03	7.7	47.7	7.7	47.7	MS	-6.83	12.81	0.00	0.05	0.00
16	5.3	-1.3	14.32	5.7	4.1	3.8	0.11	5.3	0.03	7.6	67.5	7.6	67.5	MS	-5.29	13.13	0.00	0.03	0.00
17	6.5	-1.2	14.75	6.9	4.7	4.5	0.22	6.5	0.03	8.1	67.2	8.1	67.2	MS	0.00	13.53	0.00	0.05	0.00
18	5.4	-1.2	15.78	5.6	4.1	3.8	0.22	5.4	0.05	7.6	67.1	7.6	67.1	MS	-1.85	12.92	0.00	0.07	0.00
19	5.3	-1.3	14.38	5.7	4.3	4.0	0.33	5.3	0.03	9.1	67.2	9.1	67.2	MS	1.66	14.32	0.00	0.05	0.00
20	6.0	-1.2	17.70	6.0	4.2	3.9	0.22	6.0	0.05	8.1	67.2	8.1	67.2	MS	1.24	13.11	0.00	0.07	0.00
21	3.7	-1.0	16.40	3.8	3.3	3.1	0.11	3.6	0.03	8.1	168.8	8.1	168.8	MS	-1.19	13.02	0.00	0.05	0.23
22	4.7	-1.2	15.38	4.7	3.6	3.4	0.11	4.7	0.05	7.6	134.1	7.6	134.1	MS	0.39	12.68	0.00	0.05	1.75
23	4.7	-1.0	14.20	4.9	3.6	3.4	0.11	4.7	0.05	8.1	70.9	8.1	70.9	MS	1.18	12.37	0.00	0.08	0.00
24	4.7	-1.0	15.00	4.7	3.8	3.6	0.11	4.7	0.05	7.3	138.1	7.3	138.1	MS	-0.92	12.62	0.00	0.03	0.00
25	4.7	-1.3	14.90	4.7	2.6	3.5	0.11	4.7	0.05	8.1	120.4	8.1	120.4	MS	0.26	12.89	0.00	0.04	0.25

LOVELACE TEST, MARCH 1979
TRANSDUCER 1
DAY 3

MAXIMA ARE TAKEN FROM THE 40K RECORDS
ON AXIS --- FACE-ON

***** ESTIMATED MAXIMA *****														***** IMPULSES *****														***** BASE LINE CHECKS *****													
SHOT	MAX REC PSI	MIN PSI	TIME MS	TIME PSI	EI PSI	SO PSI	MAX PSI	LST PSI	AVE PSI	SQ PSI	STD PSI	MAX1 PSI	T1 MS	ADUR MS	HOUR MS	TOTAL PSI	POS MS	DRIFT PSI	SD	BASE*	BASE*																				
1	6.1	-1.3	15.70*	6.2	4.9	4.6	0.21*	6.1	0.05	7.3	157.1	0.07	0.95*	-8.79	13.35*	0.00	0.07	0.95*																							
2	6.0	-1.2	14.00*	8.3	5.4	5.1	0.21*	8.0	0.05	7.4	43.3	0.09	0.00*	-3.05	13.00*	0.00	0.09	0.00*																							
3	7.3	-1.5	14.30*	7.9	5.5	5.2	0.21*	7.3	0.03	7.6	19.9	0.06	0.00*	-10.01	13.55*	0.00	0.06	0.00*																							
4	5.0	-1.3	14.60*	5.4	4.3	4.1	0.11*	5.0	0.03	7.4	171.0	0.06	0.00*	-5.50	12.66*	0.00	0.06	0.00*																							
5	5.6	-1.4	20.10*	5.9	3.9	3.7	0.21*	5.6	0.03	7.3	207.3	0.08	0.98*	-9.95	12.21*	0.00	0.08	0.98*																							
6	4.8	-1.5	27.35*	5.1	4.2	4.1	0.11*	4.8	0.05	7.6	0.0	0.11	1.80*	-1.65	12.17*	0.00	0.11	1.80*																							
7	6.5	-1.6	14.70*	6.7	4.8	4.5	0.21*	6.5	0.05	7.4	67.0	0.12	2.00*	-9.61	12.54*	0.00	0.12	2.00*																							
8	5.8	-1.3	14.35*	6.0	4.3	4.2	0.11*	5.8	0.05	7.5	67.1	0.09	2.55*	-8.44	12.20*	0.00	0.09	2.55*																							
9	6.0	-1.6	15.57*	6.3	4.0	3.8	0.21*	6.0	0.03	7.2	132.9	0.07	0.00*	-10.50	11.57*	0.00	0.07	0.00*																							
10	7.0	-1.4	20.05*	7.4	4.8	4.4	0.21*	7.0	0.03	7.7	39.0	0.11	0.78*	-9.59	12.42*	0.00	0.11	0.78*																							
11	6.2	-1.6	14.50*	6.3	4.5	4.3	0.11*	6.2	0.05	7.2	41.2	0.08	0.00*	-16.48	11.37*	0.00	0.08	0.00*																							
12	4.1	-1.3	27.63*	3.9	4.1	3.8	0.21*	3.7	0.23	7.5	0.0	0.08	1.43*	-12.49	13.30*	0.00	0.08	1.43*																							
13	5.0	-1.7	13.70*	5.0	4.0	3.9	0.11*	5.0	0.05	7.4	0.0	0.07	0.00*	-23.68	11.38*	0.00	0.07	0.00*																							
14	5.2	-1.4	15.60*	5.5	4.1	3.8	0.21*	5.2	0.03	7.2	0.0	1.05*	-21.47	10.64*	0.00	0.09	1.05*																								
15	4.7	-1.4	12.95*	4.8	3.8	3.6	0.21*	4.7	0.05	7.5	0.0	0.08	0.00*	-20.96	11.16*	0.00	0.08	0.00*																							
16	5.8	-1.4	15.43*	5.8	4.4	4.2	0.11*	5.8	0.05	7.5	0.0	0.07	2.63*	-25.93	10.40*	0.00	0.07	2.63*																							
17	5.4	-1.6	14.65*	6.3	4.4	4.1	0.11*	5.4	0.05	7.7	201.9	0.09	2.13*	-10.19	12.38*	0.00	0.09	2.13*																							
18	3.6	-1.3	13.85*	4.0	3.2	3.1	0.00*	3.6	0.10	7.5	0.0	0.0999	0.00*	-14.47	12.31*	0.00	0.0999	0.00*																							
19	6.0	-1.2	15.32*	6.4	4.1	3.8	0.21*	6.0	0.03	7.6	118.7	0.12	0.00*	-9.25	11.65*	0.00	0.12	0.00*																							
20	7.0	-1.3	15.38*	7.1	4.5	4.0	0.21*	7.0	0.05	7.5	46.7	0.06	0.00*	-18.48	11.32*	0.00	0.06	0.00*																							
21	7.6	-1.3	15.35*	8.0	5.0	4.7	0.21*	7.6	0.03	7.4	59.1	0.06	0.00*	-33.07	11.55*	0.00	0.06	0.00*																							
22	5.6	-1.3	24.70*	6.0	4.3	4.1	0.21*	5.6	0.03	7.2	201.6	0.06	0.00*	-18.71	11.41*	0.00	0.06	0.00*																							
23	6.5	-1.4	15.05*	6.8	4.2	3.7	0.21*	6.5	0.03	7.3	68.5	0.09	0.00*	-13.05	11.90*	0.00	0.09	0.00*																							
24	5.5	-1.4	13.20*	5.8	4.2	4.1	0.11*	5.5	0.03	9.5	208.7	0.07	0.00*	-16.69	13.59*	0.00	0.07	0.00*																							
25	5.6	-1.3	14.30*	6.0	4.3	4.1	0.11*	5.6	0.03	7.5	76.8	0.08	2.40*	-12.34	11.56*	0.00	0.08	2.40*																							

LOVELACE TEST, MARCH 1979
TRANSDUCER 1
DAY 4

MAXIMA ARE TAKEN FROM THE 40K RECORDS
ON AXIS --- FACE-ON

SHOT	MAX REC	MIN PSI	THIN" MS	EI PSI	SQ PSI	LST SO	AVE PSI	DEV	STD	ESTIMATED MAXIMA				TI MS	ADUR MS	HOUR MS	IMPULSES				BASE LINE CHECKS			
										PSI	PSI	PSI	PSI				TOTAL	POS	DRIFT	SD	BASE	SD	BASE	SD
1	6.7	-1.6	14.15	7.2	5.0	4.6	0.24	6.7	0.05	8.0	147.6	147.6	147.6	0.05	8.0	147.6	147.6	147.6	147.6	0.00	0.14	2.42	0.14	2.42
2	6.1	-1.2	15.65	6.2	5.0	4.7	0.24	6.1	0.17	0.0	20.5	20.5	20.5	0.17	0.0	20.5	20.5	20.5	20.5	0.00	0.14	999.00	0.14	999.00
3	5.4	-1.3	15.43	5.5	4.1	3.9	0.24	5.4	0.05	7.2	171.2	171.2	171.2	0.05	7.2	171.2	171.2	171.2	171.2	0.00	0.12	0.00	0.12	0.00
4	6.3	-1.3	28.05	6.6	5.2	4.9	0.24	6.3	0.05	7.8	67.3	67.3	67.3	0.05	7.8	67.3	67.3	67.3	67.3	0.00	0.14	1.18	0.14	1.18
5	4.7	-1.3	13.68	5.5	4.4	4.2	0.12	4.7	0.08	7.9	0.0	0.0	0.0	0.08	7.9	0.0	0.0	0.0	0.0	0.00	0.13	1.52	0.13	1.52
6	4.5	-1.2	14.78	4.7	4.3	4.1	0.24	4.5	0.03	7.5	116.4	116.4	116.4	0.03	7.5	116.4	116.4	116.4	116.4	0.00	0.13	0.38	0.13	0.38
7	6.5	-1.3	15.35	7.0	4.8	4.6	0.12	6.5	0.03	7.2	0.0	0.0	0.0	0.03	7.2	0.0	0.0	0.0	0.0	0.00	0.13	0.38	0.13	0.38
8	4.8	-1.2	15.65	5.2	3.8	3.7	0.12	4.8	0.05	8.0	0.0	0.0	0.0	0.05	8.0	0.0	0.0	0.0	0.0	0.00	0.13	2.28	0.13	2.28
9	6.3	-1.3	15.70	6.6	4.1	3.7	0.24	6.3	0.03	7.5	67.6	67.6	67.6	0.03	7.5	67.6	67.6	67.6	67.6	0.00	0.11	0.00	0.11	0.00
10	5.0	-1.3	28.25	5.6	4.1	3.9	0.12	5.0	0.03	7.5	0.0	0.0	0.0	0.03	7.5	0.0	0.0	0.0	0.0	0.00	0.12	2.35	0.12	2.35
11	4.7	-1.3	15.63	5.0	3.8	3.6	0.24	4.7	0.03	7.5	0.0	0.0	0.0	0.03	7.5	0.0	0.0	0.0	0.0	0.00	0.11	2.60	0.11	2.60
12	5.4	-1.3	14.80	5.7	3.9	3.7	0.12	5.4	0.03	7.3	81.8	81.8	81.8	0.03	7.3	81.8	81.8	81.8	81.8	0.00	0.12	1.98	0.12	1.98
13	6.7	-1.6	15.80	7.1	4.8	4.5	0.24	6.7	0.03	7.3	82.5	82.5	82.5	0.03	7.3	82.5	82.5	82.5	82.5	0.01	0.14	0.75	0.14	0.75
14	7.4	-1.4	14.15	7.4	5.4	5.2	0.24	7.4	0.05	7.3	67.4	67.4	67.4	0.05	7.3	67.4	67.4	67.4	67.4	0.00	0.12	0.00	0.12	0.00
15	6.0	-1.3	14.80	6.2	4.9	4.7	0.24	6.0	0.05	7.3	67.9	67.9	67.9	0.05	7.3	67.9	67.9	67.9	67.9	0.00	0.11	0.00	0.11	0.00
16	6.7	-1.3	15.55	6.7	5.2	5.0	0.12	6.7	0.05	7.5	67.8	67.8	67.8	0.05	7.5	67.8	67.8	67.8	67.8	0.00	0.11	0.08	0.11	0.08
17	5.5	-1.2	15.25	5.8	4.5	4.3	0.12	5.5	0.05	8.0	67.6	67.6	67.6	0.05	8.0	67.6	67.6	67.6	67.6	0.00	0.13	1.45	0.13	1.45
18	5.4	-1.2	15.03	5.5	4.5	4.2	0.24	5.4	0.05	7.2	119.9	119.9	119.9	0.05	7.2	119.9	119.9	119.9	119.9	0.00	0.12	0.73	0.12	0.73
19	6.5	-1.3	13.78	6.9	4.6	4.3	0.24	6.5	0.05	8.0	67.9	67.9	67.9	0.05	8.0	67.9	67.9	67.9	67.9	0.00	0.11	0.00	0.11	0.00
20	5.3	-1.2	28.18	5.8	4.1	3.9	0.12	5.3	0.03	7.2	85.3	85.3	85.3	0.03	7.2	85.3	85.3	85.3	85.3	0.00	0.12	2.30	0.12	2.30
21	5.2	-1.3	15.05	5.7	4.3	4.0	0.24	5.2	0.03	7.7	175.0	175.0	175.0	0.03	7.7	175.0	175.0	175.0	175.0	0.00	0.12	0.00	0.12	0.00
22	5.4	-1.2	28.93	5.4	4.0	3.8	0.12	5.4	0.05	7.6	68.7	68.7	68.7	0.05	7.6	68.7	68.7	68.7	68.7	0.00	0.13	0.28	0.13	0.28
23	5.7	-1.6	15.75	6.0	3.9	3.7	0.12	5.7	0.03	7.5	153.6	153.6	153.6	0.03	7.5	153.6	153.6	153.6	153.6	0.00	0.11	0.00	0.11	0.00
24	5.0	-1.2	13.85	5.5	3.8	3.5	0.12	5.0	0.03	7.5	171.5	171.5	171.5	0.03	7.5	171.5	171.5	171.5	171.5	0.00	0.09	0.00	0.09	0.00
25	5.4	-1.4	14.75	5.6	4.3	4.1	0.12	5.4	0.05	7.2	81.2	81.2	81.2	0.05	7.2	81.2	81.2	81.2	81.2	0.00	0.12	2.17	0.12	2.17

LOVELACE TEST, MARCH 1979
TRANSDUCER 1
DAY 5

MAXIMA ARE TAKEN FROM THE 40K RECORDS
ON AXIS --- FACE-ON

ESTIMATED MAXIMA										IMPUSES				BASE LINE CHECKS					
SHOT	REC	MIN	THIN	EI	SO	MAX	AVE	STD	PSI	MAXI	TI	ADUR	IDUR	TOTAL	POS	DRIFT	SD	HASE	PSI
1	6.4	-1.4	15.90*	6.4	4.9	4.6	0.23*	6.4	0.05	7.0	69.6	7.0	69.6	-12.27	11.45*	0.00	0.09	0.00*	---
2	6.7	-1.4	15.78*	6.8	4.8	4.5	0.23*	6.7	0.05	6.7	53.4	6.7	53.4	-14.16	9.99*	0.00	0.08	0.00*	---
3	5.9	-1.1	13.70*	6.3	4.3	4.0	0.12*	5.9	0.03	8.0	57.8	8.0	57.8	-6.72	12.26*	0.00	0.09	0.00*	---
4	7.0	-1.4	15.48*	7.0	5.1	4.8	0.23*	7.0	0.05	7.1	46.9	7.1	46.9	-16.03	10.11*	0.00	0.09	0.00*	---
5	3.8	-1.2	15.50*	4.4	3.5	3.4	0.00*	3.8	0.05	7.4	176.2	7.4	176.2	-9.77	12.25*	0.00	0.09	0.28*	---
6	7.0	-1.7	19.65*	7.3	4.8	4.5	0.23*	7.0	0.05	3.9	65.3	3.9	65.3	-17.45	8.64*	0.00	0.08	0.00*	---
7	4.2	-1.2	14.65*	4.5	3.5	3.3	0.12*	4.2	0.03	7.2	136.2	7.2	136.2	-8.53	12.97*	0.00	0.08	0.00*	---
8	7.4	-1.4	15.40*	7.6	4.7	4.2	0.23*	7.4	0.03	6.4	46.3	6.4	46.3	-20.49	8.94*	0.00	0.08	0.00*	---
9	4.9	-1.2	15.82*	5.3	4.0	3.8	0.12*	4.9	0.03	7.1	67.5	7.1	67.5	-7.29	11.12*	0.00	0.07	0.00*	---
10	4.1	-1.2	15.18*	3.5	3.7	3.5	0.12*	3.4	0.03	7.7	81.8	7.7	81.8	-12.64	11.63*	0.00	0.08	0.00*	---
11	8.6	-1.4	15.48*	9.2	6.0	5.5	0.34*	8.6	0.03	7.8	67.7	7.8	67.7	-13.29	11.21*	0.00	0.08	0.00*	---
12	6.7	-1.2	15.80*	7.6	5.5	5.0	0.23*	6.7	0.03	7.2	38.9	7.2	38.9	-13.68	12.75*	0.00	0.08	0.00*	---
13	5.1	-1.2	15.01*	5.4	4.1	3.9	0.12*	5.1	0.05	7.5	68.2	7.5	68.2	-3.88	13.74*	0.00	0.08	0.00*	---
14	5.4	-1.2	14.60*	5.6	4.1	3.9	0.12*	5.4	0.03	7.4	67.7	7.4	67.7	-13.72	12.16*	0.00	0.09	0.00*	---
15	5.5	-1.2	14.63*	6.4	4.4	4.2	0.12*	5.5	0.05	7.5	66.6	7.5	66.6	-8.74	11.91*	0.00	0.07	0.00*	---
16	6.0	-1.2	12.93*	6.5	5.0	4.9	0.12*	6.0	0.03	7.3	67.0	7.3	67.0	-10.53	12.86*	0.00	0.08	0.00*	---
17	6.1	-1.2	15.25*	6.5	4.5	4.2	0.12*	6.1	0.03	7.9	67.9	7.9	67.9	-6.52	12.14*	0.00	0.08	0.00*	---
18	4.8	-1.2	14.75*	4.8	3.6	3.5	0.12*	4.2	0.05	7.2	67.1	7.2	67.1	-6.81	12.34*	0.00	0.08	0.00*	---
19	6.8	-1.4	14.88*	7.2	4.8	4.6	0.23*	6.8	0.05	7.1	39.8	7.1	39.8	-14.71	10.93*	0.00	0.08	0.00*	---
20	5.1	-1.1	15.50*	5.4	4.1	3.9	0.12*	5.1	0.05	8.1	38.7	8.1	38.7	-0.89	13.41*	0.00	0.08	0.00*	---
21	5.3	-1.1	15.55*	5.9	4.2	4.0	0.12*	5.3	0.03	8.1	67.5	8.1	67.5	-10.26	12.91*	0.00	0.12	0.00*	---
22	5.3	-1.1	27.30*	6.3	4.5	4.2	0.12*	5.3	0.05	8.6	124.3	8.6	124.3	-15.40	14.18*	0.00	0.10	0.00*	---
23	5.9	-1.3	14.25*	6.1	4.5	4.2	0.12*	5.9	0.05	7.3	67.4	7.3	67.4	-12.58	12.87*	0.00	0.12	0.00*	---
24	6.6	-1.2	15.45*	6.7	4.9	4.7	0.12*	6.6	0.05	8.1	43.7	8.1	43.7	-7.08	13.56*	0.00	0.09	0.00*	---
25	4.8	-1.2	15.90*	5.1	4.3	4.1	0.12*	4.8	0.05	7.5	170.8	7.5	170.8	-15.84	12.48*	0.00	0.10	0.00*	---

LOVELACE TEST, MARCH 1979
TRANSDUCER 2
DAY 1

MAXIMA ARE TAKEN FROM THE 40K RECORDS
ON AXIS --- GRAZING

ESTIMATED MAXIMA										IMPULSES				BASE LINE CHECKS			
SHOT	MAX REC	MIN PSI	TIME	EL	SU	MAX PSI	AVE PSI	DEV	STD	MAX1	T1	ADUR	ROUR	TOTAL	PUS	DRIFT	SD
	PSI	PSI	MS	PSI	PSI	PSI	PSI	PSI	PSI	PSI	MS	MS	MS	PSI-MS---	MS---	MS---	MS---
1	4.4	-1.0	16.15*	4.4	4.4	4.4	4.2	0.20*	4.4	4.4	0.05	8.0	70.6	2.41	11.15*	0.00	0.02
2	3.8	-0.9	15.07*	4.0	3.7	3.4	3.4	0.20*	3.8	3.8	0.05	7.6	74.3	-10.82	11.22*	0.00	0.02
3	3.8	-0.9	15.60*	3.9	4.1	4.1	4.1	0.10*	3.8	3.8	0.23	7.6	82.0	-15.47	10.62*	0.00	0.03
4	4.0	-1.0	14.93*	4.0	4.0	3.7	3.7	0.20*	4.0	4.0	0.05	7.3	67.7	-23.22	10.70*	0.00	0.02
5	3.7	-0.9	13.80*	4.1	3.7	3.6	3.6	0.10*	3.7	3.7	0.03	7.4	174.3	-19.60	10.70*	0.00	0.02
6	4.2	-1.0	15.18*	4.4	4.3	4.0	4.0	0.30*	4.1	4.1	0.05	7.3	82.2	-17.94	10.91*	0.00	0.04
7	4.1	-1.0	27.80*	4.2	4.3	4.3	4.3	0.00*	4.1	4.1	0.23	7.8	67.5	-19.05	10.71*	0.00	0.03
8	3.7	-0.9	20.13*	3.8	4.3	4.3	4.1	0.10*	3.7	3.7	0.23	7.6	67.7	-16.52	10.91*	0.00	0.03
9	4.2	-0.9	19.50*	4.5	4.0	3.9	3.9	0.10*	4.2	4.2	0.05	7.2	72.6	-17.71	10.98*	0.00	0.04
10	3.8	-0.9	15.50*	4.0	4.0	3.7	3.7	0.20*	3.8	3.8	0.05	7.6	85.9	-10.66	10.95*	0.00	0.02
11	3.5	-1.0	15.15*	3.4	3.4	3.4	3.1	0.20*	3.4	3.4	0.05	7.7	68.7	-24.69	10.51*	0.00	0.02
12	4.2	-1.1	15.30*	4.2	4.2	4.2	4.0	0.10*	4.2	4.2	0.05	7.6	68.7	-10.78	10.89*	0.00	0.02
13	3.9	-0.9	15.53*	4.1	3.9	3.7	3.7	0.20*	3.9	3.9	0.05	7.9	67.9	-4.35	10.46*	0.00	0.02
14	3.5	-1.0	15.05*	3.5	3.6	3.5	3.5	0.10*	3.5	3.5	0.23	7.7	68.4	-12.71	10.86*	0.00	0.02
15	4.0	-1.0	15.32*	4.1	4.1	3.9	3.9	0.20*	4.0	4.0	0.05	7.3	68.1	-1.88	10.86*	0.00	0.02
16	3.8	-0.9	28.30*	4.1	3.6	3.5	3.5	0.10*	3.8	3.8	0.05	7.5	70.4	-6.83	10.40*	0.00	0.04
17	4.0	-1.0	15.35*	4.4	3.7	3.6	3.6	0.00*	4.0	4.0	0.05	7.4	74.0	-6.77	10.67*	0.00	0.03
18	4.7	-1.0	15.10*	4.9	4.2	4.0	4.0	0.10*	4.7	4.7	0.05	7.7	137.2	-0.59	10.77*	0.00	0.02
19	4.4	-1.0	15.30*	4.6	4.1	4.0	4.0	0.10*	4.4	4.4	0.05	7.6	68.3	-8.38	10.72*	0.00	0.03
20	3.7	-0.9	20.71*	4.0	4.0	3.7	3.7	0.20*	3.7	3.7	0.05	7.6	67.6	-9.33	10.74*	0.00	0.02
21	4.4	-0.9	14.80*	4.7	4.3	4.0	4.0	0.20*	4.4	4.4	0.05	7.3	67.6	-11.17	10.91*	0.00	0.02
22	4.2	-1.0	14.93*	3.9	3.7	3.4	3.4	0.20*	3.9	3.9	0.05	7.2	67.4	-14.84	11.14*	0.00	0.03
23	4.0	-1.0	15.00*	4.1	3.9	3.7	3.7	0.10*	4.0	4.0	0.05	7.5	55.6	-16.67	11.02*	0.00	0.02
24	3.9	-1.0	15.20*	3.9	4.4	4.3	4.3	0.10*	3.8	3.8	0.23	7.4	173.7	-9.49	11.27*	0.00	0.02
25	4.0	-0.9	14.40*	4.0	3.9	3.8	3.8	0.10*	4.0	4.0	0.05	7.9	68.1	-9.10	11.38*	0.00	0.02

LOVELACE TEST, MARCH 1979
TRANSDUCER 2
DAY 2

MAXIMA ARE TAKEN FROM THE 40K RECORDS
ON AXIS --- GRAZING

SHOT	MAX PSI	HIN PSI	TWIN MS	EI PSI	LST PSI	SO AVE	STD DEV	MAX1 PSI	T1 MS	ADUR MS	HDUR MS	IMPULSES			BASE LINE CHECKS		
												TOTAL	PUS	DRIFT	SD	BASE	PSI
1	4.7	-1.1	13.78	5.1	4.6	4.4	0.20	4.7	0.05	7.4	69.7	-0.50	10.52	0.00	0.09	0.00	
2	5.4	-0.9	15.95	5.0	4.6	4.4	0.10	5.4	0.05	7.5	67.2	-1.29	9.38	0.00	0.08	0.00	
3	4.0	-1.0	27.83	4.4	4.1	3.9	0.10	4.0	0.03	7.3	67.0	-3.54	10.14	0.00	0.06	0.00	
4	3.5	-1.1	14.90	3.5	3.7	3.5	0.10	3.5	0.15	7.2	60.7	7.50	10.09	0.00	0.06	0.00	
5	3.9	-1.0	14.70	3.9	3.7	3.6	0.10	3.9	0.05	7.3	60.7	4.72	9.96	0.00	0.07	0.00	
6	3.8	-1.0	13.85	3.8	3.2	3.1	0.10	3.8	0.05	7.3	67.8	-6.74	10.33	0.00	0.07	0.00	
7	4.7	-1.0	14.93	5.0	4.1	4.0	0.10	4.7	0.05	7.4	67.5	0.17	9.77	0.00	0.08	0.00	
8	4.3	-1.1	14.73	4.7	4.0	3.8	0.10	4.3	0.03	7.5	67.8	-1.65	10.16	0.00	0.06	0.00	
9	3.2	-1.0	27.88	3.0	3.4	3.2	0.10	3.0	0.23	7.3	80.2	-5.86	9.41	0.00	0.08	2.08	
10	3.4	-1.0	15.28	3.5	3.3	3.2	0.00	3.4	0.13	7.4	67.3	-2.12	9.90	0.00	0.07	0.00	
11	3.8	-0.9	13.23	4.1	3.7	3.6	0.10	3.8	0.05	7.5	66.8	2.26	10.30	0.00	0.07	0.00	
12	4.3	-1.0	13.60	4.4	3.7	3.6	0.10	4.3	0.05	7.9	67.0	-3.18	9.54	0.00	0.07	0.00	
13	4.1	-1.0	15.75	4.1	4.0	3.9	0.10	4.1	0.05	7.8	67.1	2.36	10.13	0.00	0.06	0.00	
14	4.5	-1.0	15.45	4.6	4.0	3.8	0.10	4.5	0.05	7.5	67.2	-6.17	9.37	0.00	0.07	1.27	
15	3.8	-0.9	19.52	3.9	3.3	3.2	0.10	3.8	0.05	7.2	67.2	0.96	9.49	0.00	0.06	0.00	
16	3.5	-1.1	27.77	3.5	3.2	3.0	0.10	3.5	0.05	7.6	68.3	-0.79	10.10	0.00	0.06	0.00	
17	3.7	-1.0	14.82	3.8	3.7	3.6	0.10	3.7	0.05	7.6	84.1	-3.95	9.89	0.00	0.07	0.82	
18	3.4	-1.0	15.40	3.3	3.3	3.1	0.10	3.3	0.05	7.6	67.2	-3.34	9.57	0.00	0.07	1.23	
19	3.8	-1.1	14.35	3.4	4.1	3.7	0.30	3.4	0.20	7.0	67.2	-3.38	10.29	0.00	0.06	0.00	
20	3.8	-1.1	14.75	4.0	3.3	3.2	0.10	3.6	0.05	7.6	67.0	2.54	9.96	0.00	0.05	0.00	
21	3.1	-0.9	15.20	2.8	3.2	2.8	0.20	2.6	0.23	8.0	142.4	5.19	9.94	0.00	0.07	1.70	
22	3.1	-1.0	15.32	3.1	3.0	2.8	0.10	3.0	0.05	7.6	69.0	-6.70	9.61	0.00	0.07	0.00	
23	3.3	-0.9	28.08	3.3	2.9	2.9	0.10	3.3	0.05	7.7	67.5	-8.87	9.35	0.00	0.04	0.00	
24	3.4	-0.9	15.43	3.5	3.2	3.1	0.10	3.4	0.05	7.5	67.5	-3.41	9.77	0.00	0.07	0.00	
25	3.3	-1.1	14.80	3.4	3.0	2.9	0.10	3.3	0.05	7.2	66.7	-4.16	9.89	0.00	0.07	0.00	

LOVELACE TEST, MARCH 1979
TRANSDUCER 2
DAY 3

MAXIMA ARE TAKEN FROM THE 40K RECORDS
ON AXIS --- GRAZING

SHOT	MAX REC PSI	MIN PSI	TMIN MS	EI PSI	ESTIMATED MAXIMA				MAX1 PSI	T1 MS	ADUR MS	INDUR MS	IMPULSES				BASE LINE CHECKS			
					1ST	2ND	3RD	4TH					TOTAL	POR	MS	---	SD	BASE	---	SD
0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.1	-1.0	15.40	5.2	4.6	4.5	4.5	4.5	5.1	0.05	7.1	68.4	6.07	10.23	0.00	0.03	0.04	0.00	0.00	0.00
3	4.9	-1.2	18.60	5.0	4.4	4.4	4.4	4.4	4.9	0.05	7.7	75.6	17.44	10.58	0.00	0.04	0.04	0.00	0.00	0.00
4	3.6	-1.2	15.20	3.9	3.8	3.8	3.8	3.8	3.6	0.15	7.6	201.7	20.03	9.76	0.00	0.07	0.07	1.60	0.00	0.00
0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	3.9	-1.3	15.28	4.0	3.8	3.7	3.7	3.7	3.9	0.17	7.6	201.2	14.44	9.70	0.00	0.08	0.08	0.00	0.00	0.00
0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	3.7	-1.0	15.15	4.2	3.7	3.7	3.7	3.7	3.7	0.05	7.5	0.0	13.75	9.77	0.00	0.03	0.03	0.00	0.00	0.00
9	4.3	-1.2	13.38	4.3	3.4	3.4	3.4	3.4	4.3	0.05	7.8	67.8	5.80	10.14	0.00	0.01	0.01	0.00	0.00	0.00
10	4.1	-1.2	19.50	4.7	3.9	3.8	3.8	3.8	4.1	0.03	7.5	67.3	18.73	10.16	0.00	0.06	0.06	0.00	0.00	0.00
11	4.5	-1.2	15.20	4.6	4.0	3.9	3.9	3.9	4.5	0.05	7.2	80.6	16.63	9.50	0.00	0.08	0.08	2.70	0.00	0.00
12	3.2	-1.0	15.90	3.1	3.3	3.2	3.2	3.2	3.1	0.20	7.4	201.9	19.13	9.63	0.00	0.05	0.05	0.78	0.00	0.00
13	3.7	-1.1	15.23	3.0	3.6	3.4	3.4	3.4	3.7	0.13	7.3	103.7	23.39	9.66	0.00	0.06	0.06	0.00	0.00	0.00
14	3.5	-1.0	27.48	3.5	3.8	3.7	3.7	3.7	3.3	0.23	7.6	80.7	8.78	9.19	0.00	0.06	0.06	1.58	0.00	0.00
15	3.4	-1.1	14.85	3.6	3.4	3.2	3.2	3.2	3.3	0.03	7.5	201.4	6.46	9.45	0.00	0.05	0.05	2.17	0.00	0.00
16	4.1	-1.0	19.35	4.1	3.8	3.8	3.8	3.8	4.1	0.05	7.6	84.6	7.29	9.90	0.00	0.04	0.04	0.00	0.00	0.00
17	4.4	-1.2	14.82	4.6	3.8	3.7	3.7	3.7	4.4	0.05	7.6	56.3	9.68	9.92	0.00	0.05	0.05	0.00	0.00	0.00
18	2.9	-1.0	19.85	2.9	2.7	2.7	2.7	2.7	2.9	0.04	7.4	80.7	10.42	9.46	0.00	0.04	0.04	0.00	0.00	0.00
19	3.8	-1.1	15.25	3.8	3.4	3.3	3.3	3.3	3.8	0.05	7.7	74.9	8.18	9.40	0.00	0.05	0.05	0.00	0.00	0.00
20	4.5	-1.0	15.23	4.8	3.6	3.4	3.4	3.4	4.5	0.05	7.8	67.7	8.36	9.73	0.00	0.04	0.04	0.00	0.00	0.00
21	4.6	-1.0	15.68	4.9	4.1	4.0	4.0	4.0	4.6	0.05	7.3	68.0	8.08	9.78	0.00	0.05	0.05	0.00	0.00	0.00
22	3.6	-0.8	28.55	3.7	3.9	3.7	3.7	3.7	3.6	0.10	7.3	90.5	8.56	9.65	0.00	0.02	0.02	0.00	0.00	0.00
23	4.1	-0.9	18.80	4.2	3.5	3.4	3.4	3.4	4.1	0.05	7.3	68.5	9.58	9.81	0.00	0.03	0.03	0.00	0.00	0.00
24	3.7	-1.2	19.00	3.8	3.6	3.5	3.5	3.5	3.7	0.15	7.3	89.5	16.36	10.04	0.00	0.05	0.05	0.00	0.00	0.00
25	4.1	-0.9	15.20	4.2	3.7	3.7	3.7	3.7	4.1	0.05	7.6	67.3	9.93	9.36	0.00	0.05	0.05	2.55	0.00	0.00

LOVELACE TEST, MARCH 1979
TRANSDUCER 2
DAY 4

MAXIMA ARE TAKEN FROM THE 40K RECORDS
ON AXIS --- GRAZING

SHOT	MAX REC PSI	ESTIMATED MAXIMA										IMPULSES					BASE LINE CHECKS			
		MIN PSI	TMIN HS	EI PSI	SO PSI	HAX PSI	LST PSI	SU PSI	DEV	MAX1 PSI	T1 HS	ADUR MS	BDUR MS	TOTAL PSI	POS MS	DRIFT	SD	BASE		
1	4.5	-1.2	27.05*	4.9	4.5	4.2	4.2	0.20*	4.5	0.05	7.7	7.7	75.2	3.48	11.19*	0.00	0.08	2.15*		
2	4.3	-1.0	16.05*	4.5	4.2	4.0	4.0	0.10*	4.3	0.05	7.7	7.7	75.2	23.95	10.70*	0.00	0.04	0.00*		
3	3.7	-1.1	15.35*	3.6	3.6	3.4	3.4	0.10*	3.6	0.05	7.0	7.0	67.7	9.01	10.73*	0.00	0.07	3.13*		
4	4.2	-1.0	28.18*	4.7	4.3	4.1	4.1	0.10*	4.2	0.03	7.6	7.6	67.3	24.04	10.91*	0.00	0.08	0.00*		
5	3.9	-1.0	14.85*	4.3	3.8	3.7	3.7	0.10*	3.9	0.05	7.8	7.8	70.4	9.65	10.91*	0.00	0.07	0.00*		
6	3.8	-0.8	28.21*	3.7	4.1	3.9	3.9	0.10*	3.5	0.23	7.5	7.5	92.3	15.20	10.64*	0.00	0.07	0.00*		
7	4.1	-1.0	15.48*	4.1	4.2	4.1	4.1	0.10*	4.0	0.23	7.2	7.2	86.0	20.94	10.89*	0.00	0.05	0.00*		
8	3.7	-1.0	13.20*	3.7	3.5	3.3	3.3	0.10*	3.7	0.05	7.9	7.9	67.6	16.81	10.54*	0.00	0.05	0.00*		
9	3.9	-1.0	27.98*	4.2	3.3	3.2	3.2	0.10*	3.9	0.05	7.8	7.8	89.8	17.15	10.52*	0.00	0.07	0.00*		
10	3.9	-1.0	26.08*	4.1	3.6	3.5	3.5	0.10*	3.9	0.05	7.6	7.6	88.1	9.05	10.81*	0.00	0.07	0.00*		
11	3.5	-0.9	15.5*	3.4	3.7	3.5	3.5	0.20*	3.3	0.20	7.6	7.6	86.0	8.69	11.09*	0.00	0.06	0.00*		
12	3.6	-0.9	15.88*	3.8	3.5	3.4	3.4	0.10*	3.6	0.05	7.4	7.4	69.9	6.47	10.84*	0.00	0.07	1.75*		
13	4.2	-0.9	15.55*	4.2	4.1	3.9	3.9	0.10*	4.2	0.05	7.6	7.6	68.2	1.15	10.88*	0.00	0.06	0.00*		
14	5.2	-0.9	15.00*	5.4	4.7	4.6	4.6	0.10*	4.2	0.05	7.5	7.5	40.0	3.39	11.07*	0.00	0.06	0.00*		
15	4.2	-0.9	14.78*	4.3	4.3	4.1	4.1	0.10*	4.2	0.05	7.5	7.5	85.7	0.31	10.97*	0.00	0.06	0.00*		
16	4.9	-0.9	28.83*	5.0	4.5	4.4	4.4	0.10*	4.9	0.05	7.5	7.5	68.0	0.66	10.66*	0.00	0.05	0.00*		
17	4.4	-0.8	28.38*	4.5	3.9	3.8	3.8	0.10*	4.4	0.05	7.4	7.4	67.5	0.13	10.57*	0.00	0.06	0.80*		
18	3.8	-0.9	15.20*	3.9	4.1	3.8	3.8	0.20*	3.8	0.05	7.3	7.3	68.0	0.85	10.58*	0.00	0.06	0.00*		
19	4.2	-0.9	28.18*	4.4	4.1	3.8	3.8	0.20*	4.2	0.05	7.9	7.9	82.2	0.46	11.09*	0.00	0.04	0.00*		
20	3.6	-0.9	28.52*	3.6	3.8	3.6	3.6	0.10*	3.5	0.15	7.3	7.3	86.1	0.89	10.80*	0.00	0.05	0.00*		
21	3.8	-1.1	15.10*	4.1	3.8	3.5	3.5	0.20*	3.8	0.05	7.8	7.8	64.1	2.00	11.22*	0.00	0.05	0.00*		
22	3.7	-0.9	15.00*	3.8	3.6	3.5	3.5	0.10*	3.7	0.05	7.5	7.5	89.9	3.89	11.08*	0.00	0.04	0.00*		
23	3.7	-0.9	16.08*	3.7	3.5	3.4	3.4	0.00*	3.7	0.05	7.7	7.7	67.7	1.47	10.82*	0.00	0.05	0.00*		
24	3.4	-0.9	28.85*	3.4	3.6	3.4	3.4	0.20*	3.3	0.23	7.3	7.3	68.4	3.10	11.00*	0.00	0.05	0.00*		
25	3.8	-0.9	13.38*	4.2	3.9	3.7	3.7	0.10*	3.8	0.03	7.3	7.3	68.3	3.90	10.81*	0.00	0.04	0.00*		

LOVELACE TEST, MARCH 1979
TRANSDUCER 2
DAY 5

MAXIMA ARE TAKEN FROM THE 40K RECORDS
ON AXIS --- GRAZING

SHOT	MAX REC PSI	MIN PSI	THIN* MS	EI PSI	ESTIMATED MAXIMA				MAXI PSI	TI MS	ADUR MS	IMUR MS	IMPULSES				BASE LINE CHECKS			
					LST	1ST	SO	DEV					TOTAL ---PSI-MS---	P05	DRIFT	SD	BASE*			
1	4.7	-1.0	14.60*	4.8	4.5	4.1	0.10*	4.7	0.05	7.8	69.6	2.39	10.42*	0.00	0.03	0.00*	0.03	0.00*	0.00*	
2	5.1	-1.0	15.20*	5.3	4.2	4.1	0.10*	5.1	0.05	7.8	53.2	-3.51	9.64*	0.00	0.05	0.00*	0.05	0.00*	0.00*	
3	4.0	-0.9	15.20*	4.4	3.7	3.6	0.10*	4.0	0.03	7.7	67.8	-12.19	9.89*	0.00	0.02	0.00*	0.02	0.00*	0.00*	
4	4.9	-1.0	19.73*	5.6	4.5	4.4	0.10*	4.9	0.03	7.6	46.8	-2.81	10.26*	0.00	0.03	0.00*	0.03	0.00*	0.00*	
5	3.5	-0.9	15.43*	3.6	3.1	3.1	0.00*	3.5	0.05	7.6	84.2	-14.82	9.83*	0.00	0.03	0.00*	0.03	0.00*	0.00*	
6	4.7	-1.2	19.60*	4.8	4.2	4.1	0.10*	4.7	0.05	7.8	65.4	-6.32	9.77*	0.00	0.03	0.00*	0.03	0.00*	0.00*	
7	3.4	-1.0	14.73*	3.2	3.0	2.8	0.10*	2.9	0.05	7.2	177.1	-6.72	10.12*	0.00	0.04	0.00*	0.04	0.00*	0.00*	
8	5.1	-0.8	13.25*	5.6	4.2	3.9	0.10*	5.1	0.03	7.3	45.7	-6.87	9.67*	0.00	0.03	0.00*	0.03	0.00*	0.00*	
9	4.1	-0.9	15.55*	4.2	3.6	3.5	0.10*	4.1	0.05	7.2	67.6	-7.33	9.63*	0.00	0.02	0.00*	0.02	0.00*	0.00*	
10	3.1	-0.9	16.15*	3.1	3.1	3.0	0.10*	2.9	0.23	7.5	81.1	-8.53	9.23*	0.00	0.03	0.00*	0.03	0.00*	0.00*	
11	5.4	-1.0	15.40*	5.7	4.7	4.5	0.10*	5.4	0.05	7.8	67.7	-0.90	9.88*	0.00	0.02	0.00*	0.02	0.00*	0.00*	
12	4.7	-1.0	27.75*	4.7	4.2	4.0	0.10*	4.7	0.05	7.2	67.2	-9.30	9.68*	0.00	0.03	0.00*	0.03	0.00*	0.00*	
13	3.9	-1.0	14.65*	4.0	3.4	3.2	0.10*	3.9	0.05	7.6	68.5	-4.95	10.32*	0.00	0.04	0.00*	0.04	0.00*	0.00*	
14	3.5	-0.9	28.58*	3.5	3.8	3.6	0.10*	3.4	0.23	7.3	85.3	-4.96	9.82*	0.00	0.03	0.00*	0.03	0.00*	0.00*	
15	4.1	-1.0	28.10*	4.2	3.6	3.5	0.10*	4.1	0.05	7.3	89.3	-8.86	9.33*	0.00	0.05	0.00*	0.05	0.00*	0.00*	
16	4.3	-0.9	28.02*	4.7	4.3	4.1	0.00*	4.3	0.05	7.3	38.5	-4.94	9.89*	0.00	0.07	0.00*	0.07	0.00*	0.00*	
17	3.9	-0.9	15.40*	4.3	3.6	3.5	0.10*	3.9	0.03	7.4	67.9	-4.44	9.52*	0.00	0.05	0.00*	0.05	0.00*	0.00*	
18	3.3	-0.9	28.02*	3.3	3.0	2.9	0.10*	3.3	0.05	7.2	49.6	-7.70	9.45*	0.00	0.03	0.00*	0.03	0.00*	0.00*	
19	4.1	-0.9	28.20*	4.6	4.0	3.9	0.10*	4.1	0.03	7.2	67.0	-1.92	9.90*	0.00	0.02	0.00*	0.02	0.00*	0.00*	
20	3.6	-0.9	15.53*	3.6	3.3	3.2	0.00*	3.6	0.05	7.7	67.6	-8.43	9.61*	0.00	0.03	0.00*	0.03	0.00*	0.00*	
21	3.5	-1.0	28.20*	3.5	3.2	3.1	0.00*	3.5	0.05	7.7	67.7	-13.80	9.37*	0.00	0.07	0.00*	0.07	0.00*	0.00*	
22	3.7	-0.8	26.27*	3.8	3.5	3.5	0.10*	3.7	0.08	6.9	66.7	-12.42	9.00*	0.00	0.06	0.00*	0.06	0.00*	0.00*	
23	3.8	-0.9	14.20*	3.8	3.6	3.5	0.10*	3.8	0.05	7.3	67.4	-12.24	9.32*	0.00	0.06	0.00*	0.06	0.00*	0.00*	
24	4.5	-1.0	15.43*	4.6	3.9	3.8	0.10*	4.5	0.05	7.6	65.8	-11.55	9.45*	0.00	0.07	0.00*	0.07	0.00*	0.00*	
25	3.5	-0.9	15.40*	3.5	3.4	3.2	0.10*	3.5	0.05	7.3	81.2	-18.20	8.89*	0.00	0.06	0.00*	0.06	0.00*	0.00*	

LOVELACE TEST, MARCH 1979
TRANSDUCER 3
DAY 1

MAXIMA ARE TAKEN FROM THE 40K RECORDS
OFF AXIS --- FACE-ON

SHOT	REC	MIN	THIN	EI	SU	MAX	AVE	STD	ESTIMATED MAXIMA				TI	ADUR	HDUR	IMPUSES BASE LINE CHECKS			
		PSI	MS	PSI	PSI	PSI	PSI	DEV	PSI	PSI	PSI	PSI	MS	MS	MS	TOTAL	POS	DRIFT	SD
1	4.9	-0.9	16.50	5.0	4.7	4.5	0.10	4.9	0.05	10.1	74.6	2.57	13.94	0.00	0.03	0.00			
2	4.8	-0.9	14.90	4.8	4.2	4.1	0.10	4.8	0.05	9.7	69.9	-9.92	14.14	0.00	0.02	0.00			
3	4.8	-1.1	14.82	5.6	4.4	4.2	0.10	4.8	0.05	9.8	70.2	-9.98	13.50	0.00	0.02	0.00			
4	4.8	-0.8	27.58	5.2	4.2	4.0	0.10	4.8	0.05	9.3	67.7	-12.65	14.21	0.00	0.02	0.00			
5	4.9	-0.9	14.82	5.7	4.2	4.0	0.20	4.9	0.05	8.1	70.8	-9.69	13.37	0.00	0.03	0.00			
6	4.9	-0.9	14.60	5.3	4.7	4.5	0.10	4.9	0.05	9.9	68.6	-6.17	14.27	0.00	0.03	0.00			
7	4.8	-0.9	15.80	4.6	4.4	4.3	0.10	4.8	0.05	9.5	70.0	-8.30	13.11	0.00	0.02	0.00			
8	4.9	-0.9	14.60	4.9	4.2	4.0	0.10	4.9	0.05	10.0	68.3	-8.52	14.16	0.00	0.02	0.00			
9	4.8	-0.8	26.35	5.1	4.3	4.1	0.10	4.8	0.05	8.9	68.6	-14.65	14.22	0.00	0.02	0.00			
0	0.0	0.0	0.00	0.0	0.0	0.0	0.00	0.0	0.00	0.0	0.0	0.00	0.00	0.00	0.00	0.00			
11	4.9	-0.9	14.25	5.4	4.7	4.5	0.10	4.9	0.05	10.0	69.3	-11.86	13.64	0.00	0.02	0.00			
12	4.8	-0.9	14.38	5.6	4.4	4.3	0.10	4.8	0.05	9.6	39.7	-11.53	13.58	0.00	0.02	0.00			
13	4.8	-0.9	14.28	5.4	4.2	4.0	0.10	4.8	0.03	9.8	39.7	-11.58	13.21	0.00	0.02	0.00			
14	4.8	-0.8	13.88	5.0	3.8	3.7	0.10	4.8	0.05	9.3	58.4	-9.36	13.77	0.00	0.03	0.00			
15	4.8	-0.9	14.48	5.3	4.0	3.8	0.10	4.8	0.05	9.4	70.7	-14.20	13.80	0.00	0.03	0.00			
16	4.9	-0.9	14.65	5.7	4.3	4.2	0.10	4.9	0.05	9.7	40.1	-4.02	13.55	0.00	0.02	0.00			
17	4.8	-0.8	27.65	4.9	4.2	4.1	0.10	4.8	0.05	9.8	71.3	-10.43	13.64	0.00	0.02	0.00			
18	4.8	-0.8	15.25	5.5	4.6	4.4	0.10	4.8	0.05	9.2	75.8	-8.54	14.54	0.00	0.03	0.00			
19	4.0	-0.8	27.93	4.4	3.5	3.3	0.10	4.0	0.03	9.9	76.7	-13.81	14.29	0.00	0.02	0.00			
20	4.9	-0.8	15.88	5.7	4.4	4.3	0.10	4.9	0.05	9.4	56.4	-3.19	13.98	0.00	0.02	0.00			
21	4.9	-1.0	14.60	5.5	4.6	4.3	0.10	4.9	0.05	8.9	70.6	-13.66	13.68	0.00	0.04	0.00			
22	4.9	-0.9	15.00	5.1	4.8	4.5	0.10	4.9	0.05	7.7	67.8	-9.31	14.32	0.00	0.03	0.00			
23	4.9	-0.9	14.45	5.0	4.4	4.3	0.10	4.9	0.05	9.1	73.8	-13.67	13.94	0.00	0.02	0.00			
24	4.9	-0.9	14.25	5.5	4.2	4.0	0.10	4.9	0.05	9.1	68.7	-13.99	14.31	0.00	0.03	0.00			
25	4.6	-0.9	27.33	5.2	3.9	3.6	0.10	4.6	0.03	8.8	67.9	-11.15	14.54	0.00	0.02	0.00			

LOVELACE TEST, MARCH 1979
TRANSDUCER 3
DAY 2

MAXIMA ARE TAKEN FROM THE 40K RECORDS
OFF AXIS --- FACE-ON

SHOT	MAX PSI	MIN PSI	THIN MS	EI PSI	LST PSI	SO AVE PSI	STD DEV PSI	MAX1 PSI	T1 MS	ADUR MS	BDUR MS	IMPULSES			BASE LINE CHECKS		
												TOTAL	POS	DRIFT	SD	BASE	+
1	6.5	-0.9	14.75	6.8	5.2	4.8	0.20	6.5	0.05	8.6	45.2	9.33	13.75	0.00	0.05	0.00	+
2	5.2	-0.8	14.68	5.5	3.8	3.4	0.20	5.2	0.03	9.5	71.1	-3.09	12.04	0.00	0.05	0.00	+
3	4.9	-0.8	27.27	5.2	4.1	3.8	0.10	4.9	0.05	8.6	67.8	-5.61	12.73	0.00	0.06	0.00	+
4	4.8	-0.8	15.00	5.1	3.9	3.8	0.10	4.8	0.05	8.9	67.5	2.58	12.27	0.00	0.06	0.00	+
5	4.7	-0.8	27.35	5.0	3.6	3.4	0.10	4.7	0.03	9.0	40.2	-0.43	12.59	0.00	0.05	0.00	+
6	6.0	-0.9	15.00	6.3	4.3	3.8	0.20	6.0	0.05	8.9	68.2	-3.84	12.86	0.00	0.07	0.00	+
7	4.1	-0.8	14.25	4.1	3.3	3.2	0.10	4.1	0.05	9.2	79.0	-4.23	12.10	0.00	0.05	0.00	+
8	6.3	-0.8	26.83	6.0	4.8	4.4	0.20	6.3	0.03	8.9	39.2	-2.92	12.56	0.00	0.05	0.00	+
9	5.2	-0.7	27.05	5.4	4.2	4.0	0.10	5.2	0.05	9.3	39.5	-9.86	12.19	0.00	0.06	0.00	+
10	6.3	-0.8	27.50	6.7	4.7	4.2	0.20	6.3	0.03	9.6	39.7	-6.06	12.62	0.00	0.04	0.00	+
11	5.6	-0.8	14.82	5.8	4.2	3.9	0.20	5.6	0.03	9.0	68.2	-7.93	12.49	0.00	0.06	0.00	+
12	5.7	-0.9	14.60	5.9	4.2	3.8	0.20	5.7	0.05	9.7	39.7	-4.57	11.89	0.00	0.06	0.00	+
13	5.2	-0.9	16.85	5.5	4.2	3.8	0.20	5.2	0.05	9.7	39.0	-8.09	12.47	0.00	0.05	0.00	+
14	4.7	-0.8	14.18	4.8	4.0	3.9	0.10	4.7	0.05	9.7	70.0	-2.06	11.77	0.00	0.00	0.00	+
15	4.5	-0.7	14.60	4.5	3.5	3.5	0.10	4.5	0.05	9.2	66.0	-3.76	11.84	0.00	0.05	0.00	+
16	5.5	-0.9	27.10	5.8	4.0	3.5	0.20	5.5	0.05	9.0	68.1	-9.86	12.52	0.00	0.06	0.00	+
17	6.0	-0.8	15.55	6.3	4.4	4.0	0.20	6.0	0.05	9.3	67.1	-6.48	12.08	0.00	0.06	0.00	+
18	5.6	-0.9	15.57	5.9	4.0	3.5	0.20	5.6	0.03	7.7	39.5	-10.89	11.48	0.00	0.06	0.00	+
19	4.7	-0.9	26.85	5.4	4.0	3.7	0.10	4.7	0.03	8.8	71.1	-7.20	12.83	0.00	0.05	0.00	+
20	4.9	-0.8	26.80	5.7	4.2	4.0	0.10	4.9	0.05	9.0	69.8	-9.78	12.19	0.00	0.06	0.00	+
21	4.8	-1.0	14.23	5.1	3.7	3.4	0.10	4.8	0.03	9.7	65.7	-3.62	12.30	0.00	0.05	0.00	+
22	4.8	-0.9	14.38	4.8	3.8	3.5	0.10	4.8	0.05	9.2	67.0	-10.27	12.05	0.00	0.06	0.00	+
23	5.3	-1.0	14.60	5.7	4.2	4.0	0.10	5.3	0.03	9.5	39.9	-1.92	12.32	0.00	0.05	0.00	+
24	5.6	-0.9	15.30	5.8	4.1	3.7	0.20	5.6	0.05	9.1	66.5	-7.47	12.18	0.00	0.06	0.00	+
25	5.4	-0.8	26.83	5.5	4.1	3.7	0.20	5.4	0.05	8.9	67.2	-7.42	12.32	0.00	0.06	0.00	+

LOVEFACE TEST, MARCH 1979
TRANSDUCER 3
DAY 3

MAXIMA ARE TAKEN FROM THE 40K RECORDS
OFF AXIS --- FACE-ON

SHOT	MAX PSI	MIN PSI	THIN* MS	EI PSI	ESTIMATED MAXIMA			T1 MS	ADUR MS	UDUR MS	IMPULSES			BASE LINE CHECKS		
					LST	LST	SO				TOTAL	PDS	DRIFT	SD	BASE	
					PSI	PSI	PSI				---	---	---			
1	7.3	-1.0	14.25*	7.0	5.5	4.9	0.30*	0.03	8.5	70.9	-5.00	13.16*	0.00	0.08	0.00*	
2	4.6	-0.8	28.35*	5.1	4.0	3.8	0.10*	0.03	8.5	49.2	-13.82	13.07*	0.00	0.08	0.00*	
3	6.8	-1.1	18.25*	7.0	5.2	4.5	0.20*	0.05	9.7	36.6	-4.08	14.38*	0.00	0.07	0.00*	
4	6.0	-0.8	27.00*	6.0	5.0	4.8	0.10*	0.05	9.9	39.2	-11.28	13.23*	0.00	0.07	0.00*	
5	5.6	-0.9	14.85*	5.0	4.3	4.0	0.10*	0.05	8.2	68.3	-11.43	12.19*	0.00	0.06	0.00*	
6	6.2	-0.8	26.77*	6.8	5.1	4.7	0.20*	0.03	8.5	19.0	-11.50	12.71*	0.00	0.06	0.00*	
7	5.5	-0.8	26.43*	5.6	4.3	4.1	0.10*	0.05	8.7	66.9	-8.50	13.36*	0.00	0.06	0.00*	
8	5.4	-0.8	14.93*	6.2	4.9	4.5	0.20*	0.03	9.2	81.7	-12.69	13.03*	0.00	0.05	0.00*	
9	6.6	-0.9	16.35*	7.0	5.0	4.8	0.10*	0.03	9.4	40.0	-16.71	12.88*	0.00	0.07	0.00*	
10	4.4	-0.9	18.00*	4.0	4.0	3.9	0.00*	0.05	9.0	76.3	-18.02	13.76*	0.00	0.07	0.00*	
11	4.7	-0.9	27.20*	4.8	4.2	4.0	0.10*	0.03	8.7	68.8	-12.47	12.93*	0.00	0.05	0.00*	
12	4.6	-0.9	14.78*	4.9	3.3	2.9	0.20*	0.03	9.2	169.9	-19.24	13.18*	0.00	0.06	0.00*	
13	6.2	-1.0	14.25*	6.3	4.6	4.1	0.20*	0.05	9.2	39.0	-17.44	13.19*	0.00	0.06	0.00*	
14	7.3	-0.8	14.85*	7.8	5.4	4.9	0.20*	0.03	9.2	19.3	-8.34	12.50*	0.00	0.05	0.00*	
15	5.8	-0.8	27.13*	6.7	5.1	4.7	0.20*	0.03	9.3	68.1	-9.77	12.61*	0.00	0.05	0.00*	
16	5.8	-0.8	14.30*	6.0	4.9	4.7	0.10*	0.05	9.2	40.2	-4.99	12.92*	0.00	0.06	0.00*	
17	6.0	-0.9	14.10*	6.3	5.3	5.0	0.10*	0.05	8.6	40.0	-6.76	13.07*	0.00	0.05	0.00*	
18	3.9	-0.8	14.53*	3.9	3.9	3.7	0.10*	0.23	9.4	72.0	-13.17	12.42*	0.00	0.05	0.00*	
19	5.1	-0.8	14.05*	5.7	4.7	4.6	0.00*	0.05	9.9	68.2	-7.44	12.55*	0.00	0.05	0.00*	
20	6.9	-0.9	14.32*	7.2	4.9	4.4	0.20*	0.03	9.2	45.0	-16.64	13.10*	0.00	0.07	0.00*	
21	6.5	-0.8	27.90*	6.7	4.9	4.6	0.20*	0.05	9.1	39.8	-7.22	13.13*	0.00	0.06	0.00*	
22	5.8	-0.8	28.25*	5.8	4.8	4.4	0.20*	0.05	8.4	39.7	-12.07	12.19*	0.00	0.05	0.00*	
23	6.2	-0.9	27.13*	6.2	4.9	4.7	0.10*	0.05	8.6	67.9	-6.37	13.13*	6.00	0.06	0.00*	
24	5.5	-1.0	18.18*	5.5	4.7	4.6	0.10*	0.05	9.0	40.4	-10.93	13.66*	8.00	0.07	0.00*	
25	5.2	-0.8	14.95*	5.4	3.9	3.7	0.10*	0.05	8.5	81.6	-12.36	12.03*	0.00	0.06	0.00*	

LOVELACE TEST, MARCH 1979
TRANSDUCER 3
DAY 4

MAXIMA ARE TAKEN FROM THE 40K RECORDS
OFF AXIS --- FACE-ON

ESTIMATED MAXIMA																	IMPULSES					EASE LINE CHECKS				
SHOT	MAX PSI	MIN PSI	THIN* MS	THIN* PSI	EI PSI	LST PSI	LST AVE PSI	LST SU DEV	MAX1 PSI	T1 MS	ADUR MS	BDUR MS	TOTAL PSI-MS---	POS	DRIFT	SD	BASE*									
1	6.9	-0.9	15.15*	7.3	5.5	5.1	0.20*	6.9	0.08	8.7	71.2	71.2	0.73	15.05*	0.00	0.09	0.00*									
2	5.3	-0.9	28.13*	6.6	4.7	4.4	0.20*	6.3	0.03	9.3	40.3	40.3	-7.82	14.85*	0.00	0.05	0.00*									
3	5.3	-0.9	27.23*	6.1	4.5	4.4	0.10*	5.3	0.05	8.7	68.5	68.5	-12.20	15.05*	0.00	0.07	0.00*									
4	6.7	-0.9	27.65*	7.3	5.2	4.9	0.20*	6.7	0.03	8.9	62.8	62.8	-10.95	15.34*	0.00	0.06	0.00*									
5	4.9	-0.8	15.13*	5.1	4.3	4.2	0.10*	4.9	0.05	9.2	81.8	81.8	-9.82	14.33*	0.00	0.07	0.00*									
6	6.1	-0.9	27.48*	6.1	5.1	4.9	0.10*	6.1	0.05	8.2	39.8	39.8	-13.31	14.32*	0.00	0.08	0.00*									
7	4.9	-0.9	15.60*	5.3	4.4	4.3	0.10*	4.9	0.05	8.8	68.9	68.9	-9.15	15.21*	0.00	0.07	0.00*									
8	6.0	-0.9	14.95*	6.2	4.7	4.3	0.20*	6.0	0.05	9.6	65.8	65.8	-6.91	14.36*	0.00	0.06	0.00*									
9	6.7	-0.9	27.13*	7.1	5.3	4.8	0.20*	6.7	0.05	9.7	39.0	39.0	-12.70	14.30*	0.00	0.06	0.00*									
10	6.9	-0.9	27.60*	7.4	5.3	4.8	0.20*	6.9	0.03	9.7	39.6	39.6	-10.64	14.67*	0.00	0.08	0.00*									
11	5.3	-0.9	27.40*	5.7	4.5	4.4	0.10*	5.3	0.05	9.3	68.9	68.9	-10.86	14.87*	0.00	0.06	0.00*									
12	5.6	-0.9	14.00*	5.7	4.6	4.3	0.10*	5.6	0.05	10.0	41.0	41.0	-3.64	14.79*	0.00	0.06	0.00*									
13	6.0	-0.8	27.77*	6.2	5.0	4.9	0.10*	6.0	0.05	9.6	40.1	40.1	-0.94	15.01*	0.00	0.07	0.00*									
14	6.0	-0.9	27.50*	6.0	5.0	4.9	0.10*	6.0	0.05	8.8	42.2	42.2	-4.13	14.93*	0.00	0.07	0.00*									
15	6.0	-0.9	15.25*	6.8	5.4	5.1	0.10*	6.0	0.03	8.7	40.2	40.2	-2.49	14.81*	0.00	0.07	0.00*									
16	5.8	-1.0	16.00*	6.2	4.8	4.7	0.10*	5.5	0.05	8.8	49.1	49.1	-8.78	14.10*	0.00	0.07	0.00*									
17	5.8	-0.8	27.30*	6.7	5.2	4.9	0.10*	5.8	0.03	8.9	39.3	39.3	-1.46	14.39*	0.00	0.07	0.00*									
18	6.2	-0.8	28.40*	6.6	4.7	4.4	0.20*	6.2	0.03	9.2	39.4	39.4	-8.82	13.80*	0.00	0.07	0.00*									
19	6.2	-0.8	27.55*	6.4	4.8	4.6	0.10*	6.2	0.05	9.1	71.3	71.3	-6.10	14.48*	0.00	0.08	0.00*									
20	4.9	-1.1	27.70*	5.0	4.0	3.8	0.10*	4.9	0.05	9.0	66.0	66.0	-11.54	14.46*	0.00	0.08	0.00*									
21	6.1	-0.9	15.80*	6.5	4.7	4.4	0.20*	6.1	0.05	9.0	40.1	40.1	-8.26	14.61*	0.00	0.07	0.00*									
22	6.0	-0.9	27.52*	6.7	5.2	4.9	0.10*	6.0	0.03	8.7	46.5	46.5	-3.09	14.74*	0.00	0.07	0.00*									
23	6.5	-0.9	27.70*	6.8	5.1	4.8	0.10*	6.5	0.03	6.8	39.9	39.9	-4.74	13.42*	0.00	0.06	0.00*									
24	5.3	-0.9	28.73*	5.3	4.5	4.4	0.10*	5.3	0.05	9.5	68.4	68.4	-10.51	14.41*	0.00	0.07	0.00*									
25	7.1	-0.9	27.90*	7.5	5.6	5.3	0.20*	7.1	0.05	9.2	39.8	39.8	-7.92	14.68*	0.00	0.07	0.00*									

LOVELACE TEST, MARCH 1979
TRANSDUCER 3
DAY 5

MAXIMA ARE TAKEN FROM THE 40K RECORDS
OFF AXIS --- FACE-DN

ESTIMATED MAXIMA										IMPULSES BASE LINE CHECKS									
SHOT	MAX REC	PSI	MIN	THIN	EI	SO	LST	AVE	STD	ADUR	TI	MS	HOUR	TOTAL	POS	DRIFT	SD	BASE	BASE
1	6.8	-0.8	15.15*	7.2	5.4	4.9	0.20*	6.8	0.05	8.1	0.05	71.4	71.4	7.83	13.48*	0.00	0.03	0.00*	0.00*
2	5.8	-0.7	29.81*	6.3	4.6	4.2	0.20*	5.8	0.03	9.4	0.03	34.7	34.7	-2.83	12.77*	0.00	0.03	0.00*	0.00*
3	5.4	-0.8	15.95*	5.4	4.3	4.2	0.10*	5.4	0.05	9.8	0.05	66.3	66.3	-3.06	12.78*	0.00	0.30	0.00*	0.00*
4	5.4	-0.8	18.90*	5.7	4.2	4.0	0.10*	5.4	0.05	8.9	0.05	41.9	41.9	-5.42	13.00*	0.00	0.03	0.00*	0.00*
5	6.1	-0.8	15.10*	6.8	5.2	4.9	0.20*	6.1	0.03	7.8	0.03	39.7	39.7	-1.14	12.69*	0.00	0.02	0.00*	0.00*
6	5.2	-0.8	14.32*	5.7	3.9	3.5	0.20*	5.2	0.03	9.4	0.03	66.0	66.0	-3.81	13.03*	0.00	0.02	0.00*	0.00*
7	6.5	-0.8	27.10*	6.9	4.9	4.7	0.20*	6.5	0.03	9.2	0.03	39.2	39.2	0.48	13.16*	0.00	0.02	0.00*	0.00*
8	5.1	-0.7	14.80*	5.2	4.4	4.2	0.10*	5.1	0.05	9.6	0.05	68.4	68.4	-2.83	12.74*	0.00	0.01	0.00*	0.00*
9	4.3	-0.8	14.57*	4.5	3.2	3.0	0.10*	4.3	0.05	8.7	0.05	82.8	82.8	-11.99	12.19*	0.00	0.03	0.00*	0.00*
10	5.4	-0.7	27.98*	5.7	4.4	4.1	0.10*	5.4	0.05	8.6	0.05	39.6	39.6	-3.15	12.00*	0.00	0.02	0.00*	0.00*
11	5.2	-0.8	27.48*	5.7	4.1	3.9	0.10*	5.2	0.03	9.2	0.03	69.0	69.0	1.73	13.00*	0.00	0.00	0.00*	0.00*
12	6.7	-0.8	27.15*	7.2	5.2	4.9	0.20*	6.7	0.05	7.7	0.05	39.5	39.5	-3.11	13.09*	0.00	0.04	0.00*	0.00*
13	7.4	-0.9	14.80*	7.8	5.8	5.2	0.30*	7.4	0.05	7.5	0.05	40.0	40.0	-6.25	12.84*	0.00	0.01	0.00*	0.00*
14	6.1	-0.9	27.30*	6.7	4.7	4.3	0.20*	6.1	0.03	9.1	0.03	39.8	39.8	-3.50	12.93*	0.00	0.06	0.00*	0.00*
15	6.0	-0.9	27.13*	6.3	4.6	4.4	0.10*	6.0	0.05	8.2	0.05	67.7	67.7	-7.11	12.38*	0.00	0.03	0.00*	0.00*
16	4.1	-0.8	14.85*	4.7	3.5	3.2	0.10*	4.1	0.03	8.0	0.03	81.9	81.9	-4.09	12.93*	0.00	0.00	0.00*	0.00*
17	7.0	-0.8	27.40*	7.4	5.1	4.6	0.30*	7.0	0.05	9.6	0.05	39.4	39.4	-2.78	12.72*	0.00	0.04	0.00*	0.00*
18	5.9	-0.8	27.20*	6.3	4.6	4.2	0.20*	5.9	0.05	8.4	0.05	70.1	70.1	-3.41	12.38*	0.00	0.04	0.00*	0.00*
19	5.7	-0.8	27.23*	5.9	4.9	4.6	0.10*	5.7	0.05	8.8	0.05	39.4	39.4	-0.48	12.87*	0.00	0.05	0.00*	0.00*
20	5.0	-0.8	14.48*	5.6	4.2	3.9	0.20*	5.0	0.03	9.2	0.03	39.4	39.4	-8.62	12.88*	0.00	0.00	0.00*	0.00*
0	0.0	0.0	0.00*	0.0	0.0	0.0	0.00*	0.0	0.00	0.0	0.00	0.0	0.0	0.00	0.00*	0.00	0.00	0.00*	0.00*
0	0.0	0.0	0.00*	0.0	0.0	0.0	0.00*	0.0	0.00	0.0	0.00	0.0	0.0	0.00	0.00*	0.00	0.00	0.00*	0.00*
0	0.0	0.0	0.00*	0.0	0.0	0.0	0.00*	0.0	0.00	0.0	0.00	0.0	0.0	0.00	0.00*	0.00	0.00	0.00*	0.00*
0	0.0	0.0	0.00*	0.0	0.0	0.0	0.00*	0.0	0.00	0.0	0.00	0.0	0.0	0.00	0.00*	0.00	0.00	0.00*	0.00*
0	0.0	0.0	0.00*	0.0	0.0	0.0	0.00*	0.0	0.00	0.0	0.00	0.0	0.0	0.00	0.00*	0.00	0.00	0.00*	0.00*
0	0.0	0.0	0.00*	0.0	0.0	0.0	0.00*	0.0	0.00	0.0	0.00	0.0	0.0	0.00	0.00*	0.00	0.00	0.00*	0.00*
0	0.0	0.0	0.00*	0.0	0.0	0.0	0.00*	0.0	0.00	0.0	0.00	0.0	0.0	0.00	0.00*	0.00	0.00	0.00*	0.00*

LOVELACE TEST, MARCH 1979
TRANSDUCER 4
DAY 1

MAXIMA ARE TAKEN FROM THE 40K RECORDS
OFF AXIS --- GRAZING

SHOT	REC	MIN	THIN	EI	BO	MAX	AVE	DEV	MAX1	T1	ADUR	INDUR	IMPUSES			BASE LINE CHECKS		
													TOTAL	POS	DRIFT	SD	BASE	
	PSI	PSI	MS	PSI	PSI	PSI	PSI	PSI	PSI	MS	MS	MS	---	---	---			
1	4.3	-0.9	16.52	4.4	3.8	3.7	0.00	4.3	0.05	8.5	79.2	19.2	0.38	10.87	0.00	0.04	0.00	
2	3.5	-1.0	14.70	4.0	3.4	3.4	0.00	3.5	0.05	8.7	83.2	83.2	-6.16	11.25	0.00	0.04	0.00	
3	3.9	-1.1	14.65	4.1	3.5	3.4	0.10	3.9	0.05	7.5	54.4	54.4	-6.22	10.49	0.00	0.03	0.00	
4	3.4	-0.9	14.23	3.4	3.3	3.3	0.00	3.4	0.05	7.5	81.5	81.5	-13.65	10.91	0.00	0.04	0.00	
5	3.5	-0.9	14.80	4.0	3.4	3.3	0.10	3.5	0.05	7.6	73.1	73.1	-9.42	10.75	0.00	0.03	0.00	
6	4.2	-1.0	14.38	4.2	3.7	3.6	0.00	4.2	0.05	7.5	66.4	66.4	-5.62	10.95	0.00	0.03	0.00	
7	4.0	-0.9	14.35	4.2	3.6	3.5	0.00	4.0	0.05	8.6	70.4	70.4	-7.34	10.55	0.00	0.03	0.00	
8	3.8	-1.0	14.70	3.8	3.4	3.3	0.00	3.8	0.05	8.0	81.3	81.3	-6.55	10.88	0.00	0.02	0.00	
9	3.7	-0.9	14.10	4.0	3.5	3.5	0.10	3.7	0.05	7.7	79.5	79.5	-10.89	11.24	0.00	0.04	0.00	
10	3.6	-0.9	14.57	3.9	3.5	3.5	0.00	3.6	0.05	9.5	80.8	80.8	-6.85	11.27	0.00	0.04	0.00	
11	4.2	-0.9	14.30	4.2	3.7	3.6	0.10	4.2	0.05	9.4	69.8	69.8	-8.80	10.69	0.00	0.03	0.00	
12	4.0	-0.9	14.36	4.1	3.5	3.4	0.10	4.0	0.05	9.4	47.6	47.6	-5.74	10.90	0.00	0.04	0.00	
13	3.7	-0.9	14.55	3.9	3.3	3.2	0.10	3.7	0.05	9.4	82.1	82.1	-5.07	10.52	0.00	0.05	0.00	
14	3.0	-0.9	13.82	3.4	3.0	2.9	0.10	3.0	0.03	8.1	84.6	84.6	-7.80	10.66	0.00	0.04	0.00	
15	3.4	-0.9	14.57	3.7	3.1	3.1	0.00	3.3	0.03	7.6	81.4	81.4	-7.12	10.79	0.00	0.04	0.00	
16	3.5	-1.0	14.53	3.8	3.5	3.5	0.10	3.5	0.05	6.8	85.0	85.0	-0.36	10.37	0.00	0.02	0.00	
17	3.9	-0.8	27.50	4.1	3.4	3.3	0.10	3.9	0.05	9.1	82.5	82.5	-8.06	10.37	0.00	0.07	0.00	
18	4.0	-0.9	14.40	4.2	3.6	3.5	0.10	4.0	0.05	8.7	77.0	77.0	-4.14	10.86	0.00	0.03	0.00	
19	2.8	-0.9	14.82	3.0	2.8	2.7	0.00	2.8	0.05	9.5	80.6	80.6	-10.63	10.64	0.00	0.04	0.00	
20	3.5	-0.9	14.60	3.7	3.5	3.5	0.00	3.5	0.05	8.1	80.9	80.9	-3.68	10.71	0.00	0.02	0.00	
21	4.0	-0.9	14.65	4.0	3.6	3.5	0.20	4.0	0.05	8.7	72.1	72.1	-6.33	11.07	0.00	0.03	0.00	
22	4.3	-0.9	14.78	4.4	3.9	3.6	0.20	4.3	0.05	7.6	75.0	75.0	-7.26	11.23	0.00	0.04	0.00	
23	3.8	-1.0	14.50	3.8	3.5	3.5	0.00	3.8	0.05	8.8	47.7	47.7	-10.04	10.95	0.00	0.03	0.00	
24	3.8	-1.0	14.30	3.8	3.4	3.3	0.00	3.8	0.05	8.1	80.9	80.9	-6.21	11.14	0.00	0.03	0.00	
25	3.1	-0.9	26.98	3.3	2.9	2.9	0.00	3.1	0.05	8.7	81.9	81.9	-6.23	11.50	0.00	0.02	0.00	

LOVELACE TEST, MARCH 1979
TRANSDUCER 4
DAY 2

MAXIMA ARE TAKEN FROM THE 40K RECORDS
OFF AXIS --- GRAZING

SHOT	REC	MIN	THIN	EI	SU	LST	AVE	AVE	STD	MAX1	T1	ADUR	UDUR	IMPULSES			PAGE LINE CHECKS		
		PSI	MS	PSI	PSI	PSI	PSI	PSI	DEV	PSI	MS	MS	MS	TOTAL	POS	DRIFT	SD	BASE	
1	3.8	-0.9	14.93	4.2	3.7	3.6	0.00	3.8	0.05	8.3	70.5	9.12	10.31	0.00	0.00	0.00	0.00	0.00	
2	2.8	-0.8	14.75	3.0	2.7	2.6	0.10	2.8	0.05	8.8	76.7	-4.55	9.21	0.00	0.00	0.00	0.00	0.00	
3	3.0	-0.8	13.85	3.0	2.9	2.8	0.10	3.0	0.05	8.5	56.9	2.13	9.98	0.00	0.00	0.00	0.00	0.00	
4	3.8	-0.8	14.18	2.9	3.2	3.0	0.10	2.9	0.15	8.0	72.1	3.43	9.50	0.00	0.00	0.00	0.00	0.00	
5	2.9	-0.9	14.45	2.9	2.8	2.6	0.10	2.9	0.05	8.2	82.7	-2.17	9.59	0.00	0.00	0.00	0.00	0.00	
6	3.2	-0.9	13.65	3.7	3.0	3.0	0.00	3.2	0.03	8.7	81.7	1.43	10.19	0.00	0.00	0.00	0.00	0.00	
7	2.6	-0.8	14.35	2.6	2.5	2.4	0.10	2.6	0.15	8.6	137.8	-2.62	9.40	0.00	0.00	0.00	0.00	0.00	
8	3.5	-0.8	16.10	3.8	3.4	3.3	0.00	3.5	0.05	8.6	81.7	-0.20	9.82	0.00	0.00	0.00	0.00	0.00	
9	3.8	-0.8	16.00	4.1	3.3	3.2	0.10	3.8	0.05	8.6	67.7	-3.97	9.26	0.00	0.00	0.00	0.00	0.00	
10	3.5	-0.8	27.52	4.0	3.3	3.2	0.10	3.5	0.03	9.4	82.0	-7.37	9.67	0.00	0.00	0.00	0.00	0.00	
11	3.3	-0.9	14.45	3.4	3.0	3.0	0.00	3.3	0.05	8.7	82.4	-2.11	9.84	0.00	0.00	0.00	0.00	0.00	
12	3.4	-0.9	14.48	3.4	3.0	3.0	0.00	3.4	0.05	8.9	48.0	-1.50	9.30	0.00	0.00	0.00	0.00	0.00	
13	3.6	-0.9	14.40	3.6	3.2	3.0	0.10	3.6	0.05	7.9	75.4	-6.01	9.38	0.00	0.00	0.00	0.00	0.00	
14	2.9	-1.0	14.38	2.9	3.1	3.0	0.10	2.9	0.17	8.0	129.1	-3.70	8.99	0.00	0.00	0.00	0.00	0.00	
15	2.8	-0.8	13.80	3.0	2.8	2.7	0.10	2.8	0.05	8.8	126.5	-2.22	9.41	0.00	0.00	0.00	0.00	0.00	
16	3.0	-0.8	14.12	3.3	2.8	2.7	0.10	3.0	0.05	8.8	95.4	-5.31	9.94	0.00	0.00	0.00	0.00	0.00	
17	3.3	-0.9	14.57	3.8	3.1	3.1	0.00	3.3	0.05	8.9	88.3	-4.89	9.78	0.00	0.00	0.00	0.00	0.00	
18	3.4	-0.9	15.57	3.6	3.0	2.8	0.10	3.4	0.03	7.7	72.9	-6.70	9.34	0.00	0.00	0.00	0.00	0.00	
19	3.4	-0.9	14.45	3.5	3.0	2.9	0.10	3.4	0.05	8.6	78.3	-7.78	10.01	0.00	0.00	0.00	0.00	0.00	
20	3.5	-0.8	15.48	3.5	3.2	3.1	0.00	3.5	0.05	8.8	81.1	-1.25	9.76	0.00	0.00	0.00	0.00	0.00	
21	0.0	0.0	0.00	0.0	0.0	0.0	0.00	0.0	0.00	0.0	9.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
22	3.4	-1.0	14.48	3.6	3.0	2.9	0.10	3.4	0.05	9.0	64.5	-6.75	9.54	0.00	0.00	0.00	0.00	0.00	
23	3.3	-0.9	14.57	3.3	3.0	3.0	0.10	3.3	0.05	7.8	86.5	-6.60	9.12	0.00	0.00	0.00	0.00	0.00	
24	3.0	-0.9	27.58	3.5	2.9	2.9	0.00	3.0	0.05	8.8	80.4	-3.48	9.66	0.00	0.00	0.00	0.00	0.00	
0	0.0	0.0	0.00	0.0	0.0	0.0	0.00	0.0	0.00	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

LOVELACE TEST, MARCH 1979
TRANSDUCER 4
DAY 3

MAXIMA ARE TAKEN FROM THE 40K RECORDS
OFF AXIS --- GRAZING

SHOT	REC	MIN	THIN	EI	ESTIMATED MAXIMA			MAXI	TI	ADUR	RDUR	IMPULSES			BASE LINE CHECKS		
		PSI	MS	PSI	LST	SO	AVE	PSI	MS	MS	MS	TOTAL	POS	MS	DRIFT	SD	BASE
1	4.3	-0.9	14.954	4.4	3.8	3.7	0.00*	4.3	0.05	8.2	70.9	5.64	10.25*	0.00	0.04	0.00*	
2	3.0	-0.8	14.681	3.0	3.0	2.9	0.00*	3.0	0.05	8.2	74.0	0.90	10.60*	0.00	0.03	0.00*	
3	3.9	-1.1	13.754	4.2	3.8	3.8	0.10*	3.9	0.05	7.9	60.0	1.59	10.75*	0.00	0.02	0.00*	
4	4.0	-0.9	18.401	4.3	3.7	3.6	0.06*	4.0	0.05	6.7	81.1	10.68	9.62*	0.00	0.04	0.00*	
5	3.4	-0.9	14.38*	3.7	3.2	3.1	0.10*	3.4	0.03	8.0	82.7	4.50	10.10*	0.00	0.02	0.00*	
6	4.3	-0.9	13.751	4.4	3.8	3.6	0.10*	4.3	0.05	8.2	55.4	4.75	10.07*	0.00	0.03	0.00*	
7	3.6	-0.9	14.60*	3.7	3.2	3.0	0.10*	3.6	0.05	8.1	67.1	10.13	10.16*	0.00	0.08	0.00*	
8	3.5	-0.8	13.60*	4.0	3.4	3.4	0.00*	3.5	0.05	8.1	55.8	10.11	10.00*	0.00	0.04	0.00*	
9	4.0	-1.0	14.40*	4.0	3.7	3.6	0.10*	4.0	0.05	8.0	86.7	7.87	9.89*	0.00	0.04	0.00*	
10	3.2	-0.9	14.451	3.2	3.1	3.1	0.00*	3.3	0.05	8.9	185.3	13.53	10.67*	0.00	0.04	0.00*	
11	3.3	-0.8	27.15*	3.3	3.1	3.1	0.00*	3.3	0.05	7.3	61.2	5.01	10.07*	0.00	0.02	0.00*	
12	2.7	-1.0	14.78*	2.5	2.2	2.1	0.00*	2.3	0.03	8.5	193.1	15.54	9.90*	0.00	0.03	0.00*	
13	4.1	-0.9	14.43*	4.3	3.4	3.2	0.10*	4.1	0.05	8.1	51.5	10.72	10.18*	0.00	0.05	0.00*	
14	4.2	-0.7	27.83*	4.6	3.8	3.7	0.10*	4.2	0.03	6.8	48.0	1.92	9.03*	0.00	0.04	0.00*	
15	3.9	-0.8	14.38*	4.4	3.6	3.5	0.10*	3.9	0.03	8.1	78.3	3.74	9.91*	0.00	0.04	0.00*	
16	3.6	-1.0	14.32*	4.0	3.6	3.5	0.10*	3.6	0.05	8.4	76.7	0.37	9.96*	0.00	0.03	0.00*	
17	4.2	-0.9	14.30*	4.2	3.8	3.7	0.00*	4.2	0.05	8.6	76.5	1.38	10.22*	0.00	0.03	0.00*	
18	2.9	-0.9	14.581	2.9	3.1	3.0	0.10*	2.9	0.23	8.3	75.7	8.98	10.01*	0.00	0.03	0.00*	
19	3.7	-0.8	18.60*	3.7	3.5	3.5	0.00*	3.7	0.05	8.4	82.1	6.76	9.51*	0.00	0.02	0.00*	
20	3.9	-0.8	14.45*	3.9	3.5	3.4	0.00*	3.9	0.05	8.7	76.8	9.47	9.92*	0.00	0.04	0.00*	
21	4.1	-0.8	13.98*	4.3	3.5	3.4	0.10*	4.1	0.05	7.9	82.1	4.85	10.06*	0.00	0.03	0.00*	
22	4.2	-0.9	14.53*	4.4	3.5	3.3	0.10*	4.2	0.05	6.9	68.3	11.84	8.97*	0.00	0.08	0.00*	
23	4.0	-0.8	15.63*	4.1	3.5	3.5	0.10*	4.0	0.03	7.8	82.3	2.53	10.29*	0.00	0.02	0.00*	
24	3.5	-0.9	19.55*	4.0	3.6	3.5	0.10*	3.5	0.05	8.1	72.2	4.29	10.53*	0.00	0.04	0.00*	
25	2.9	-0.9	14.57*	2.9	2.9	2.7	0.10*	2.9	0.05	8.2	84.4	9.24	9.71*	0.00	0.02	0.00*	

LOVELACE TEST, MARCH 1979
TRANSDUCER 4
DAY 4

MAXIMA ARE TAKEN FROM THE 40K RECORDS
OFF AXIS --- GRAZING

SHOT	MAX REC PSI	ESTIMATED MAXIMA										IMPUSES			BASE LINE CHECKS			
		MIN PSI	TMIN MS	EI PSI	SO PSI	LST PSI	MAX PSI	AVE PSI	DEV PSI	MAXI PSI	T1 MS	ADUR MS	MDUR MS	TOTAL PSI-MS	POS MS	DRIFT	SD	BASE
1	4.0	-1.1	49.63*	4.4	3.8	3.7	3.7	0.00*	4.0	0.05	8.1	94.8	11.11	11.41*	0.00	0.04	0.00*	
2	3.8	-1.0	14.68*	3.8	3.3	3.3	3.3	0.00*	3.8	0.05	9.1	80.2	0.47	11.31*	0.00	0.00	0.00*	
3	3.4	-1.1	24.13*	3.8	3.3	3.3	3.3	0.00*	3.4	0.03	8.0	79.3	-0.93	11.38*	0.00	0.03	0.00*	
4	4.0	-0.9	15.68*	4.0	3.7	3.6	3.6	0.10*	4.0	0.05	8.3	52.1	-1.17	11.27*	0.00	0.03	0.00*	
5	3.4	-0.8	15.95*	3.8	3.3	3.2	3.2	0.10*	3.4	0.03	8.4	82.1	0.81	10.87*	0.00	0.03	0.00*	
6	3.8	-0.9	15.48*	4.2	3.7	3.6	3.6	0.00*	3.8	0.05	8.0	56.0	-6.74	10.90*	0.00	0.03	0.00*	
7	3.6	-0.8	15.80*	3.8	3.3	3.2	3.2	0.10*	3.6	0.05	8.0	82.4	-6.54	11.01*	0.00	0.05	0.00*	
8	3.5	-1.0	14.70*	3.6	3.3	3.2	3.2	0.00*	3.5	0.05	9.2	74.1	-1.72	10.73*	0.00	0.02	0.00*	
9	4.0	-0.9	14.55*	4.4	3.5	3.4	3.4	0.10*	4.0	0.03	8.4	67.1	-7.25	10.66*	0.00	0.03	0.00*	
10	4.1	-1.0	27.65*	4.4	3.6	3.5	3.5	0.10*	4.1	0.05	8.4	82.9	-7.67	10.83*	0.00	0.05	0.00*	
11	3.7	-0.9	14.55*	4.0	3.4	3.3	3.3	0.10*	3.7	0.05	8.6	52.0	-3.76	11.11*	0.00	0.02	0.00*	
12	3.5	-0.9	14.15*	3.8	3.3	3.2	3.2	0.00*	3.5	0.05	7.8	82.7	-1.22	10.72*	0.00	0.04	0.73*	
13	4.0	-0.9	15.75*	4.2	3.6	3.6	3.6	0.10*	4.0	0.05	8.2	77.5	2.06	11.01*	0.00	0.03	0.00*	
14	3.7	-0.8	27.40*	4.3	3.7	3.6	3.6	0.00*	3.7	0.03	7.8	76.5	1.66	11.21*	0.00	0.02	0.00*	
15	4.0	-0.8	14.00*	4.5	3.8	3.8	3.8	0.00*	4.0	0.03	6.8	82.5	3.94	10.56*	0.00	0.02	0.00*	
16	4.0	-0.8	27.80*	4.3	3.6	3.6	3.6	0.00*	3.9	0.05	8.5	82.5	0.82	10.78*	0.00	0.02	0.00*	
17	3.7	-0.8	27.30*	4.3	3.6	3.6	3.6	0.00*	3.7	0.03	6.6	81.7	4.17	10.16*	0.00	0.02	0.00*	
18	3.5	-0.8	15.73*	3.8	3.3	3.2	3.2	0.00*	3.5	0.03	6.6	143.3	2.48	10.09*	0.00	0.02	0.00*	
19	3.6	-0.8	27.68*	3.8	3.5	3.4	3.4	0.10*	3.6	0.05	8.3	52.7	0.26	10.77*	0.00	0.03	0.00*	
20	3.1	-1.0	27.65*	3.1	2.9	2.8	2.8	0.10*	3.1	0.05	8.2	83.3	-1.35	11.09*	0.00	0.03	0.00*	
21	3.6	-1.0	15.75*	3.8	3.3	3.2	3.2	0.10*	3.6	0.05	8.4	83.2	-0.44	11.13*	0.00	0.08	2.45*	
22	4.0	-0.8	27.85*	4.4	3.7	3.6	3.6	0.10*	4.0	0.05	8.1	82.6	3.84	10.78*	0.00	0.03	0.00*	
23	4.0	-0.9	27.83*	4.0	3.6	3.6	3.6	0.00*	4.0	0.05	6.7	83.0	-4.76	10.19*	0.00	0.04	0.00*	
24	3.5	-0.8	16.35*	3.6	3.4	3.2	3.2	0.10*	3.5	0.05	8.1	83.0	-1.05	10.80*	0.00	0.02	0.00*	
25	4.4	-0.8	14.18*	4.5	3.9	3.8	3.8	0.10*	4.4	0.05	8.1	82.2	-4.42	10.63*	0.00	0.04	0.00*	

LOVELACE TEST, MARCH 1979
TRANSDUCER 4
DAY 5

MAXIMA ARE TAKEN FROM THE 40K RECORDS
OFF AXIS --- GRAZING

SHOT	MAX PSI	REC PSI	MIN PSI	THIN* MS	EI PSI	ESTIMATED MAXIMA				MAX1 PSI	TI MS	ADJR MS	BDUR MS	IMPULSES BASE LINE CHECKS			
						LST	SO	MAX	AVE	DEV							
						PSI		PSI	PSI					TOTAL	POS	DRIFT	SD
														---PSI-MS---			
1	4.5	-1.0	14.80*	4.6	4.0	3.9	0.10*	4.5	0.0%	8.1	71.5	71.5	7.96	11.02*	0.00	0.00	0.00*
2	4.3	-0.8	14.20*	4.5	3.6	3.4	0.10*	4.3	0.03	9.1	52.5	52.5	-2.95	10.57*	0.00	0.00	0.00*
3	3.8	-0.9	16.00*	3.8	3.5	3.4	0.10*	3.8	0.01	6.8	72.4	72.4	-5.34	10.15*	0.00	0.00	0.00*
4	3.3	-0.9	14.03*	3.7	3.2	3.1	0.10*	3.3	0.03	8.6	52.2	52.2	-7.41	10.89*	0.00	0.01	0.00*
5	4.4	-0.8	14.75*	4.4	3.8	3.7	0.10*	4.4	0.05	7.7	47.8	47.8	-0.97	10.37*	0.00	0.00	0.00*
6	3.3	-0.9	14.20*	3.4	2.9	2.7	0.10*	3.3	0.05	9.3	77.8	77.8	-0.94	10.57*	0.00	0.00	0.00*
7	3.8	-0.9	13.68*	4.1	3.6	3.5	0.10*	3.8	0.05	8.9	71.5	71.5	-2.88	10.41*	0.00	0.00	0.00*
8	3.7	-0.8	14.45*	3.7	3.3	3.2	0.10*	3.7	0.05	7.8	83.1	83.1	-0.17	10.34*	0.00	0.03	0.00*
9	2.8	-0.8	28.02*	4.0	3.2	3.1	0.10*	2.8	0.05	8.7	85.8	85.8	-11.13	9.91*	0.00	0.01	0.00*
10	3.9	-0.9	14.43*	3.5	3.0	2.9	0.00*	3.9	0.03	7.1	82.1	82.1	-4.38	9.41*	0.00	0.00	0.00*
11	3.1	-0.9	15.30*	4.7	3.8	3.7	0.10*	3.1	0.03	9.1	83.1	83.1	-2.82	10.36*	0.00	0.00	0.00*
12	4.5	-0.9	27.88*	5.2	4.2	4.0	0.10*	4.5	0.05	7.6	67.8	67.8	-1.13	10.36*	0.00	0.07	0.00*
13	4.8	-0.9	15.68*	4.2	3.5	3.3	0.10*	4.8	0.05	7.8	39.0	39.0	-4.18	10.48*	0.00	0.02	0.00*
14	3.9	-0.8	15.68*	4.0	3.4	3.3	0.10*	3.9	0.05	8.1	73.0	73.0	-4.55	10.10*	0.00	0.01	0.00*
15	3.7	-0.8	28.00*	2.9	2.5	2.5	0.00*	3.7	0.05	8.3	81.2	81.2	-10.40	9.94*	0.00	0.03	0.00*
16	3.1	-0.8	15.53*	3.8	3.5	3.4	0.10*	2.7	0.05	8.0	82.3	82.3	-4.45	10.31*	0.00	0.01	0.00*
17	3.9	-0.8	14.20*	4.3	3.5	3.4	0.10*	3.9	0.05	8.2	82.8	82.8	-4.94	10.19*	0.00	0.00	0.00*
18	3.8	-0.8	15.55*	3.8	3.3	3.2	0.10*	3.8	0.05	8.2	75.8	75.8	-3.55	9.96*	0.00	0.00	0.00*
19	4.6	-0.8	13.68*	4.6	3.7	3.5	0.10*	4.6	0.05	8.0	70.6	70.6	-4.18	10.04*	0.00	0.01	0.00*
20	3.5	-0.9	14.57*	3.8	3.2	3.1	0.00*	3.5	0.05	9.2	56.3	56.3	-12.67	10.40*	0.00	0.02	0.00*
21	3.4	-0.9	14.63*	3.7	3.1	3.0	0.00*	3.4	0.03	8.9	56.2	56.2	-10.72	10.46*	0.00	0.01	0.00*
22	4.1	-0.9	22.18*	4.5	4.0	3.8	0.10*	4.1	0.03	7.4	79.0	79.0	-18.92	10.46*	0.00	0.04	0.00*
23	4.1	-0.9	14.73*	4.2	3.6	3.6	0.10*	4.1	0.05	7.0	81.7	81.7	-11.10	9.79*	0.00	0.02	0.00*
24	3.4	-0.8	13.98*	3.6	3.3	3.2	0.10*	3.4	0.05	9.1	80.2	80.2	-8.88	10.36*	0.00	0.01	0.00*
25	3.7	-0.8	14.55*	3.9	3.5	3.3	0.00*	3.7	0.05	6.9	48.1	48.1	-5.99	9.81*	0.00	0.07	0.00*

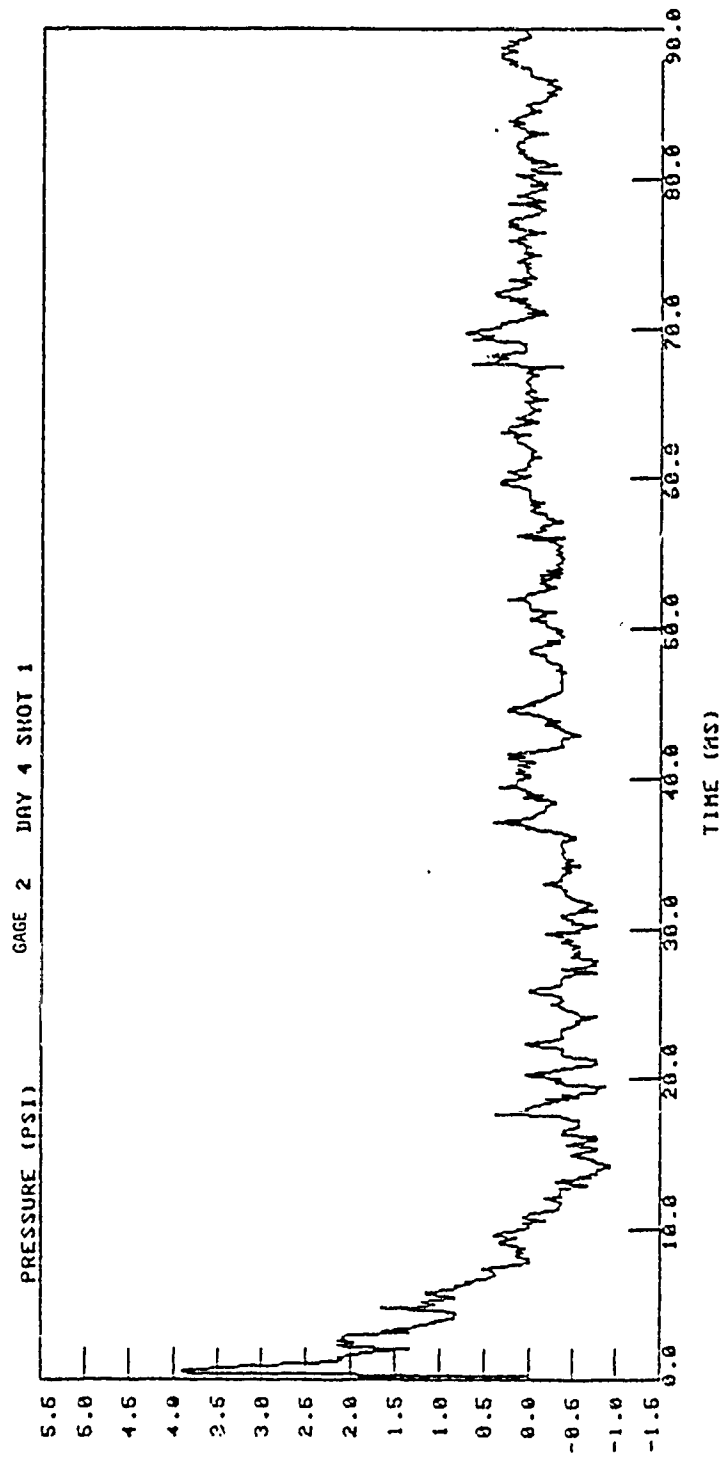
SECTION F

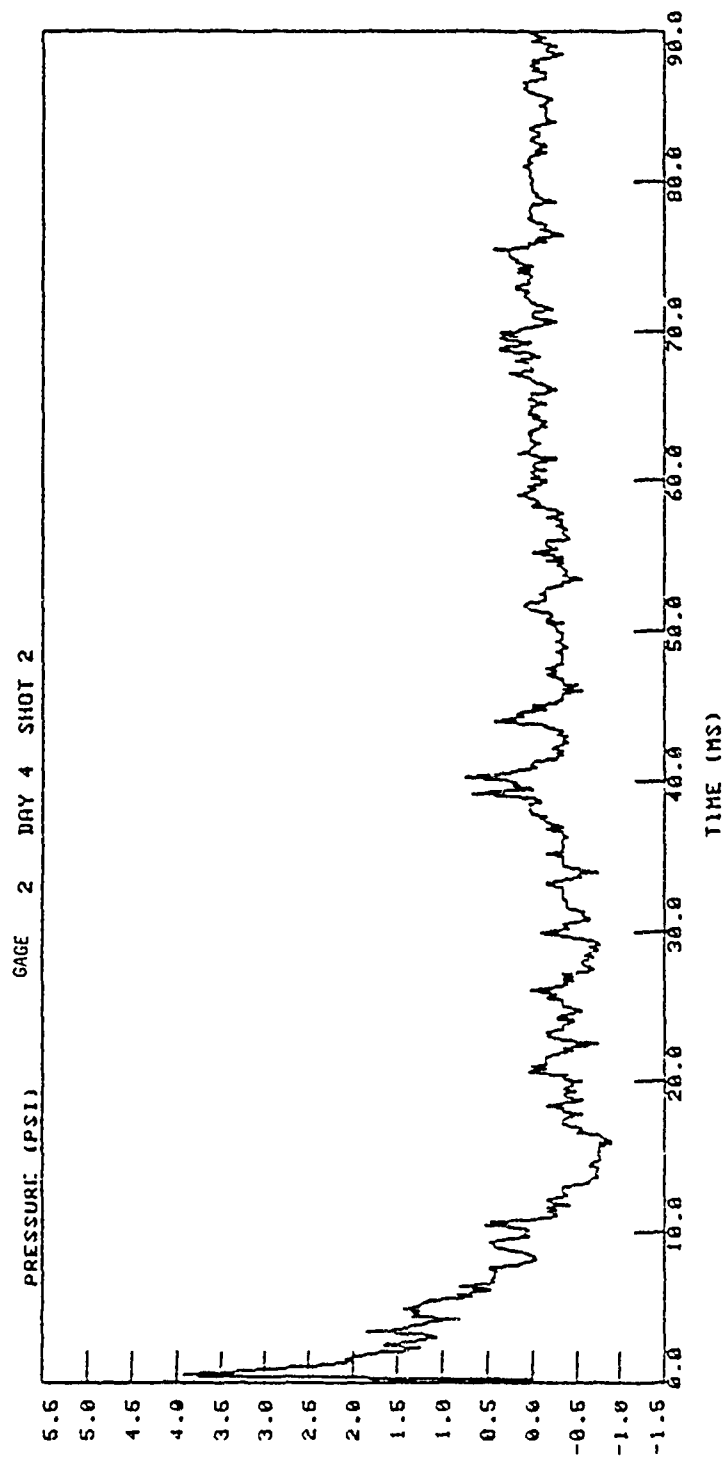
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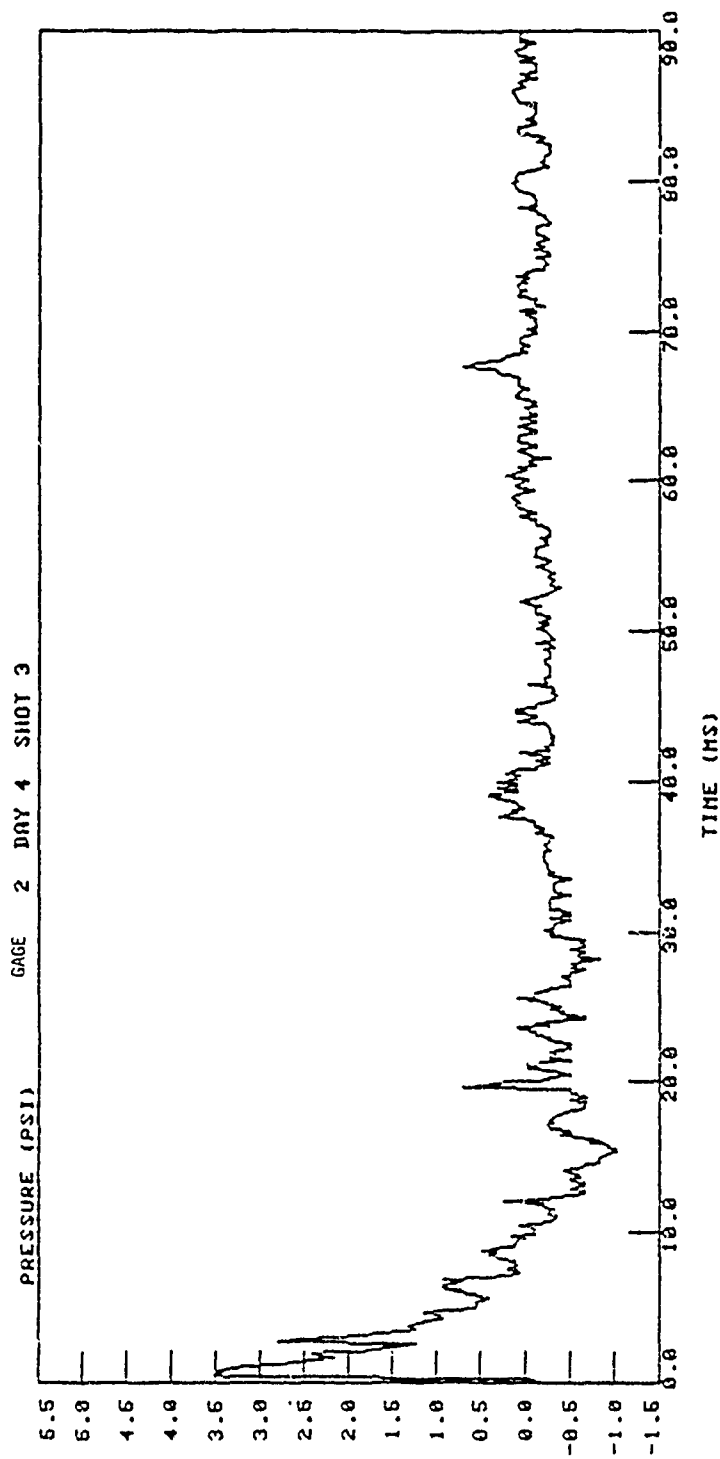
LOVELACE: GAGE 2 DAY 4 SHOTS 1-25
9 ms RECORDS PLOTTED. DATA DECIMATED TO 8 kHz SAMPLING RATE
USED FOR PLOTS

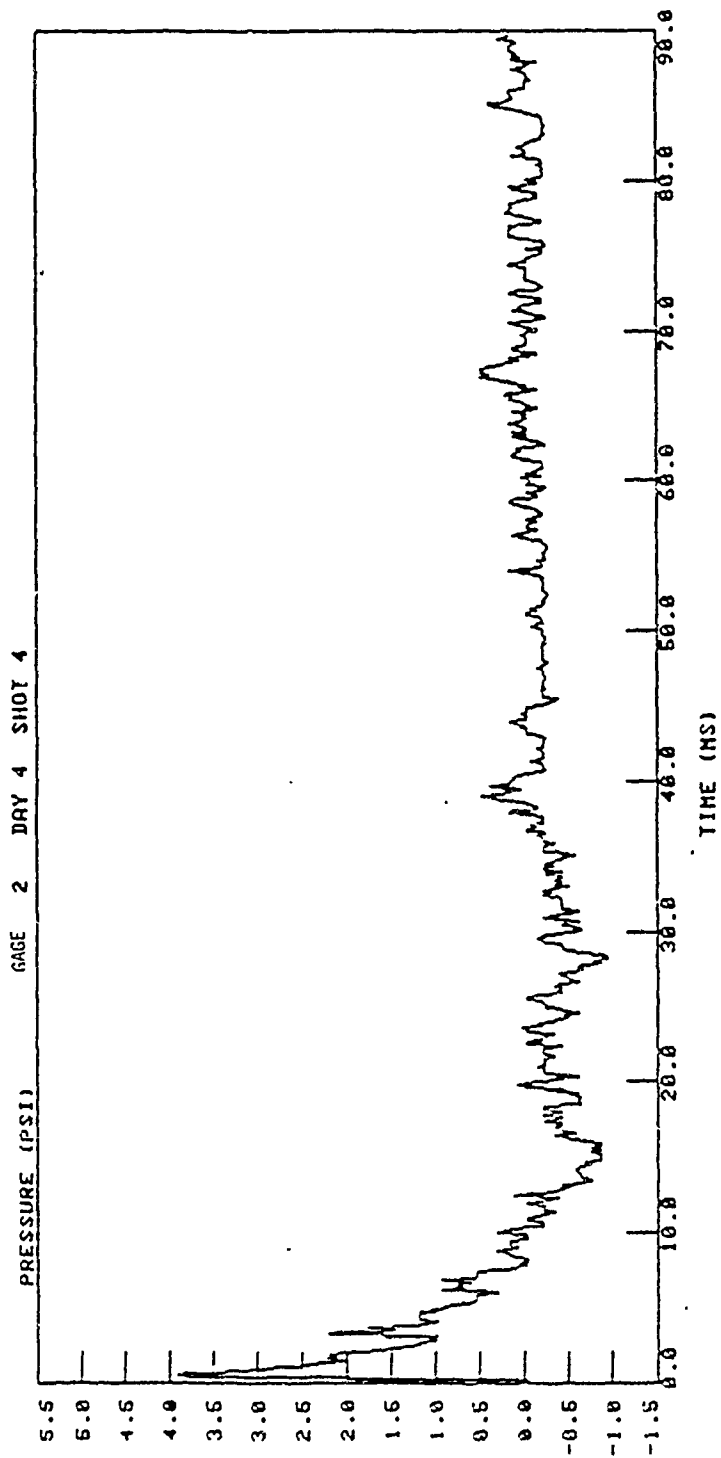
ABERDEEN: MISCELLANEOUS M-198 INDIVIDUAL SHOTS
INDICATED BY STATION LOCATION, HEIGHT OF TRANSDUCER
IN FEET, AZIMUTH OF FIRE, ELEVATION OF TUBE IN MILS,
AND THE SHOT NUMBER

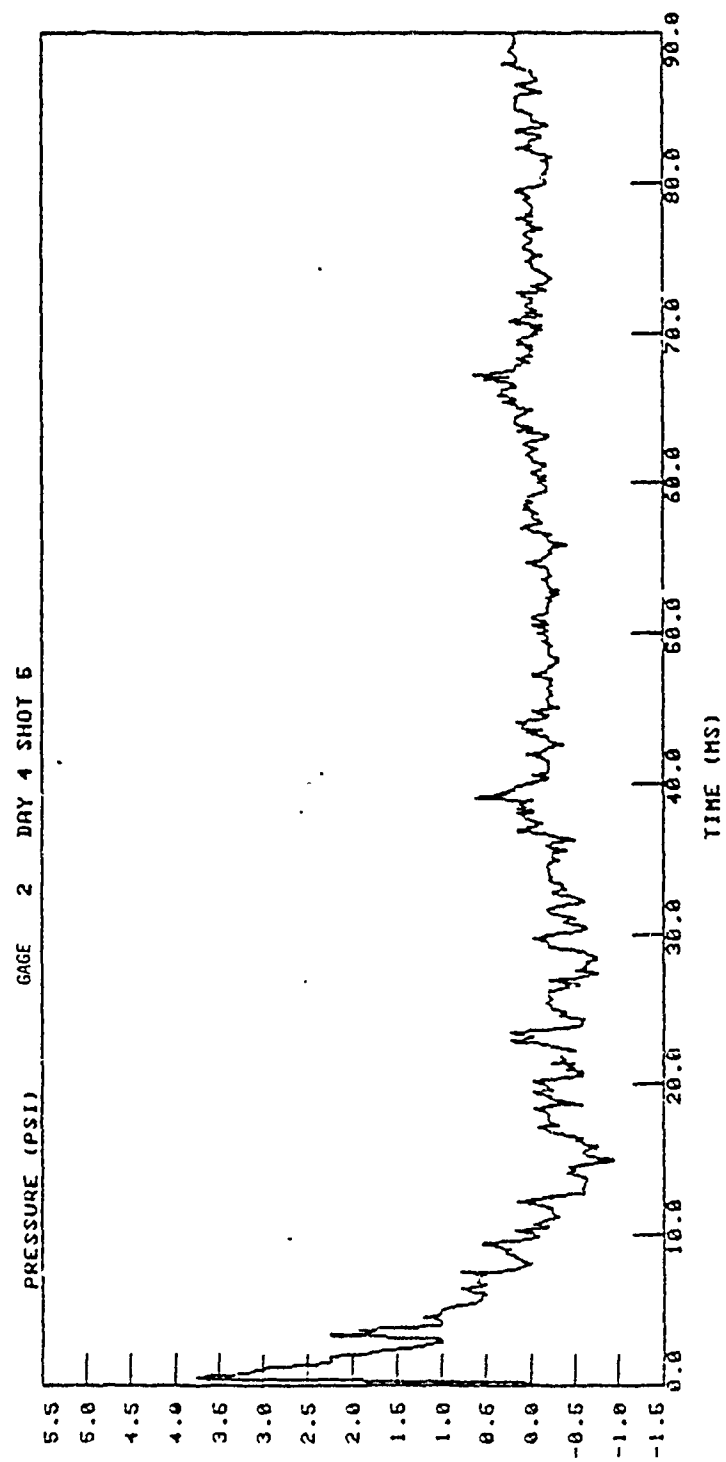
VARIATION OF PEAK OVERPRESSURES FROM SHOT-TO-SHOT FOR THE SHOCK TUBE

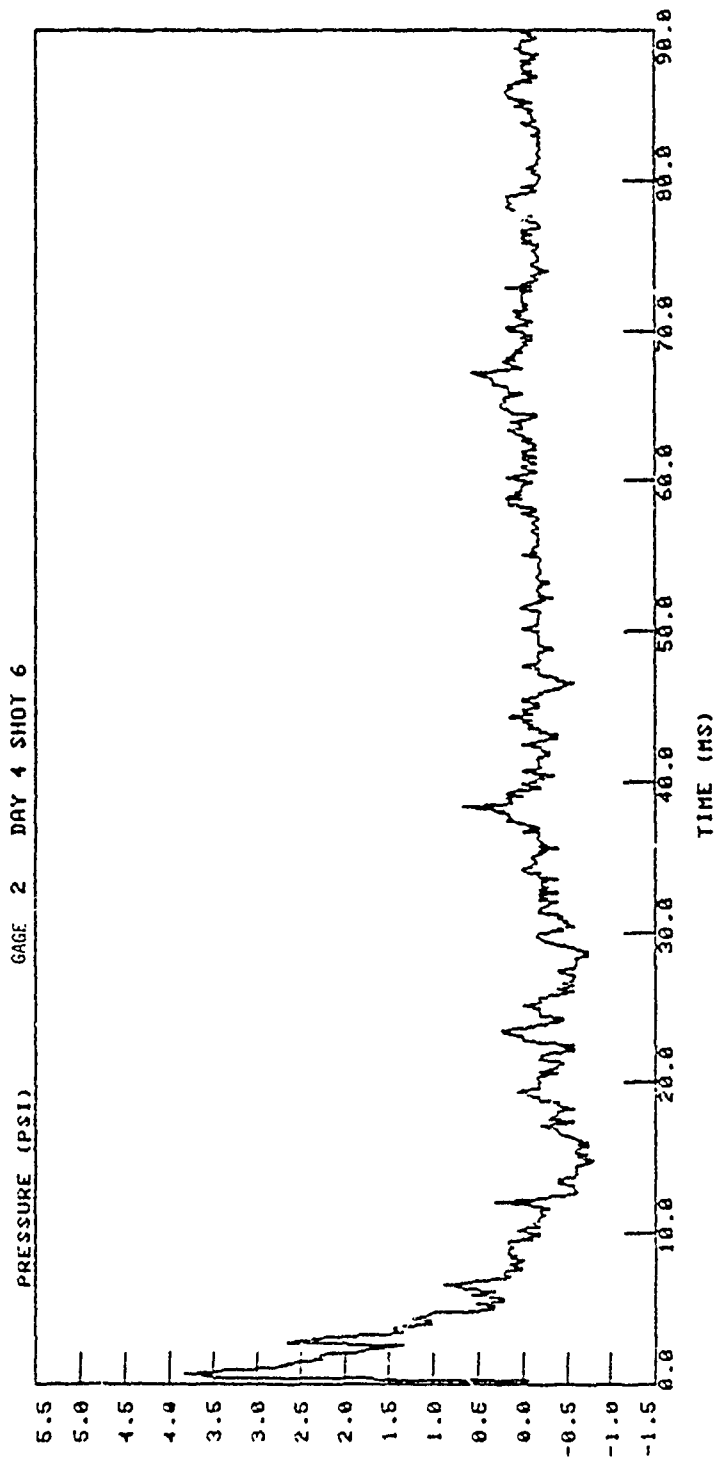


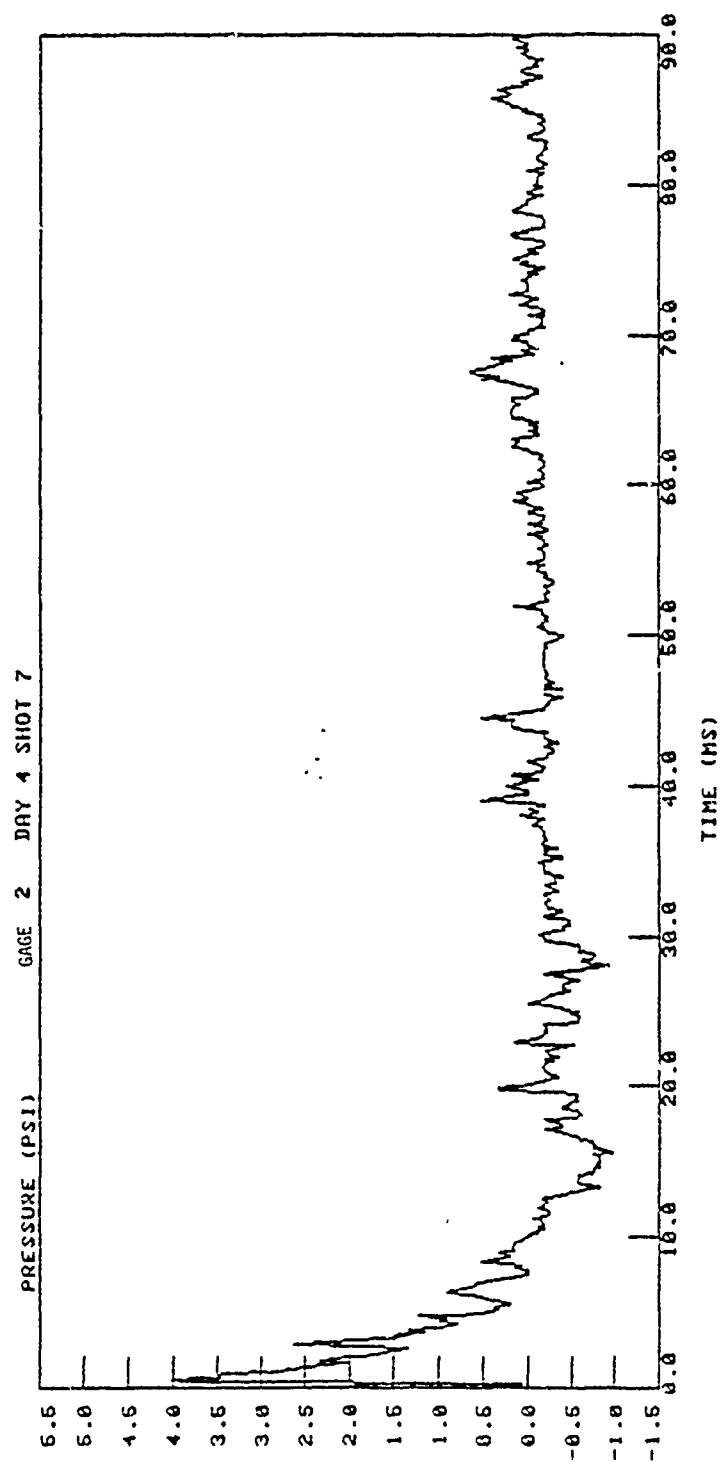


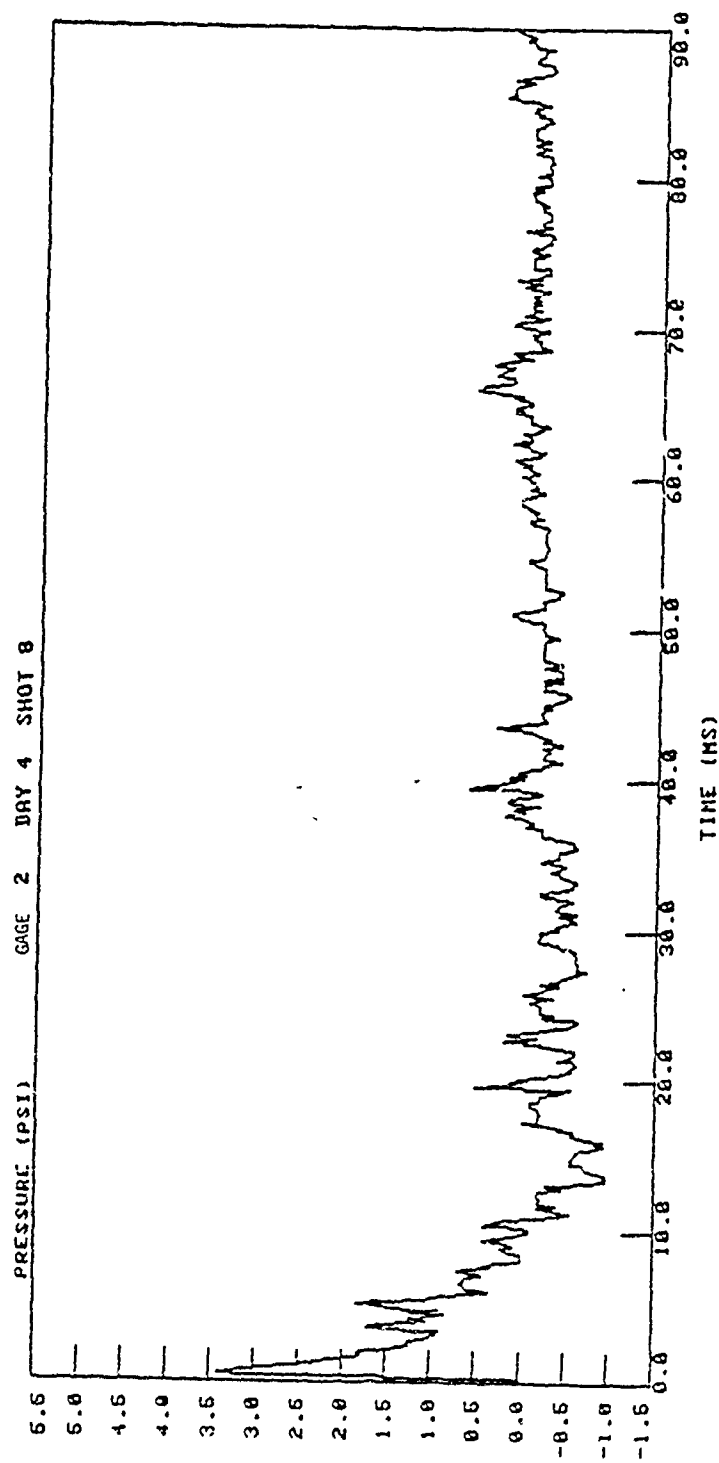


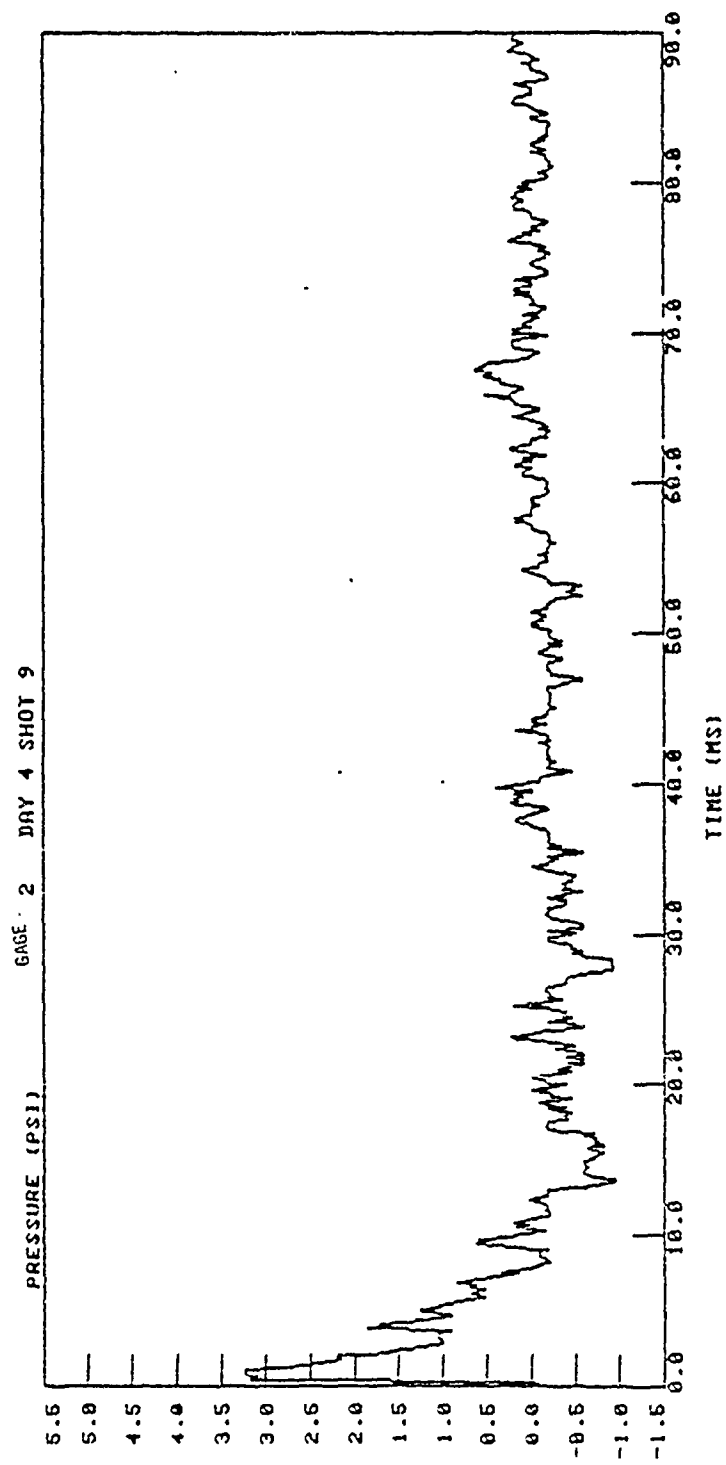


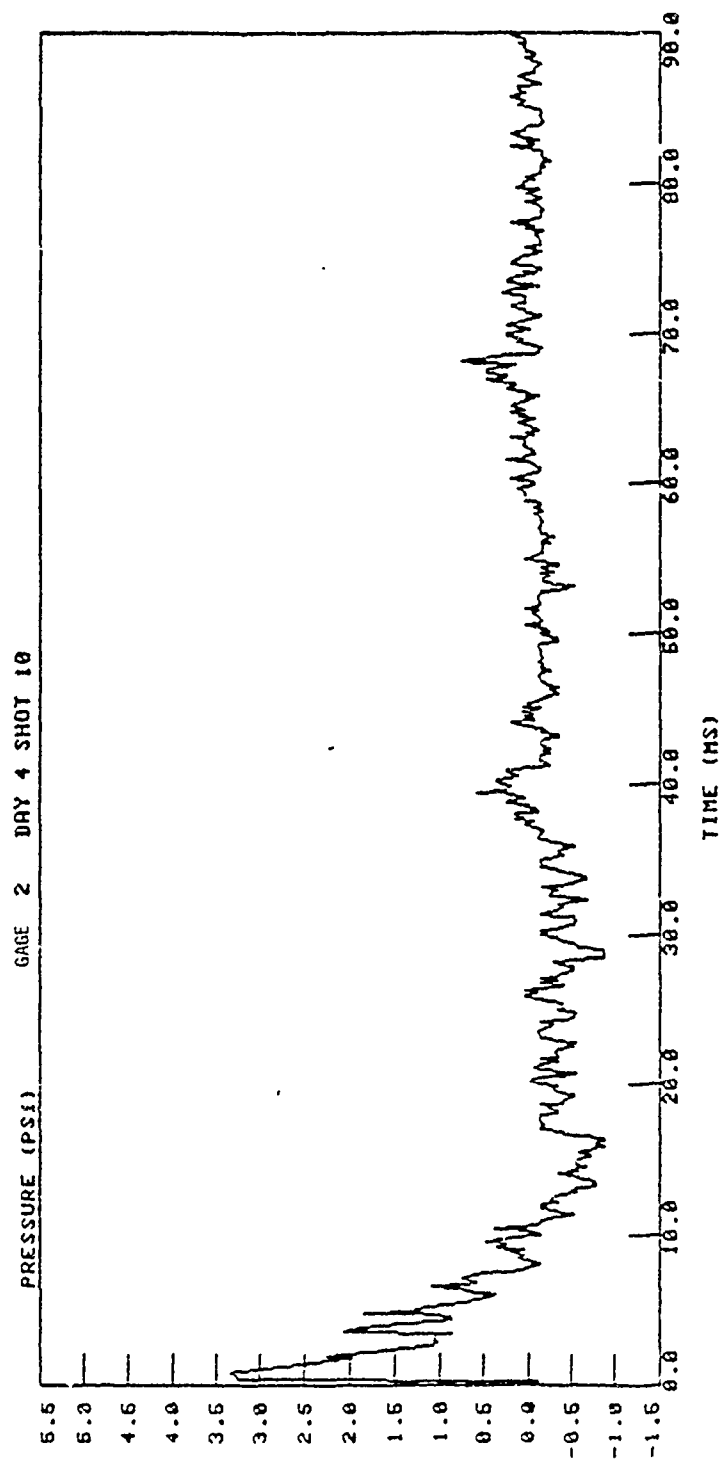


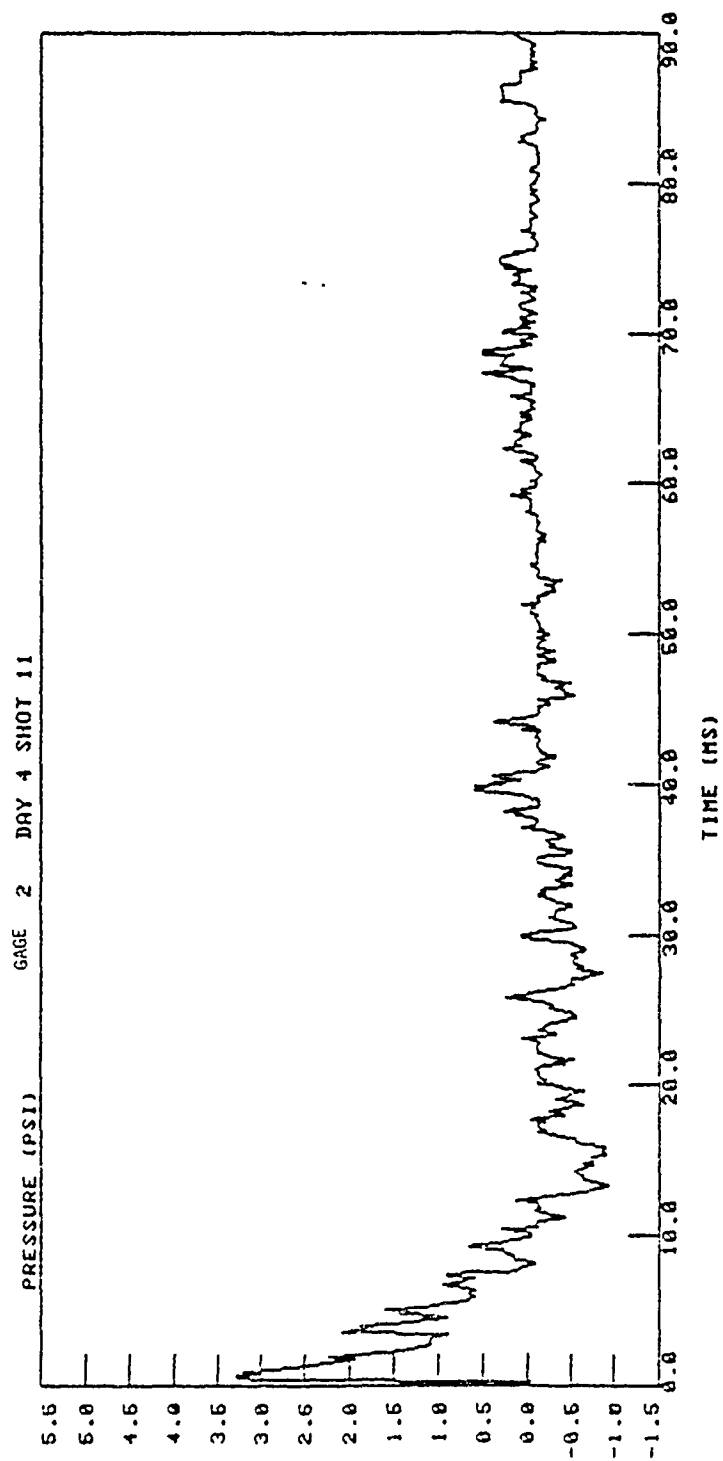


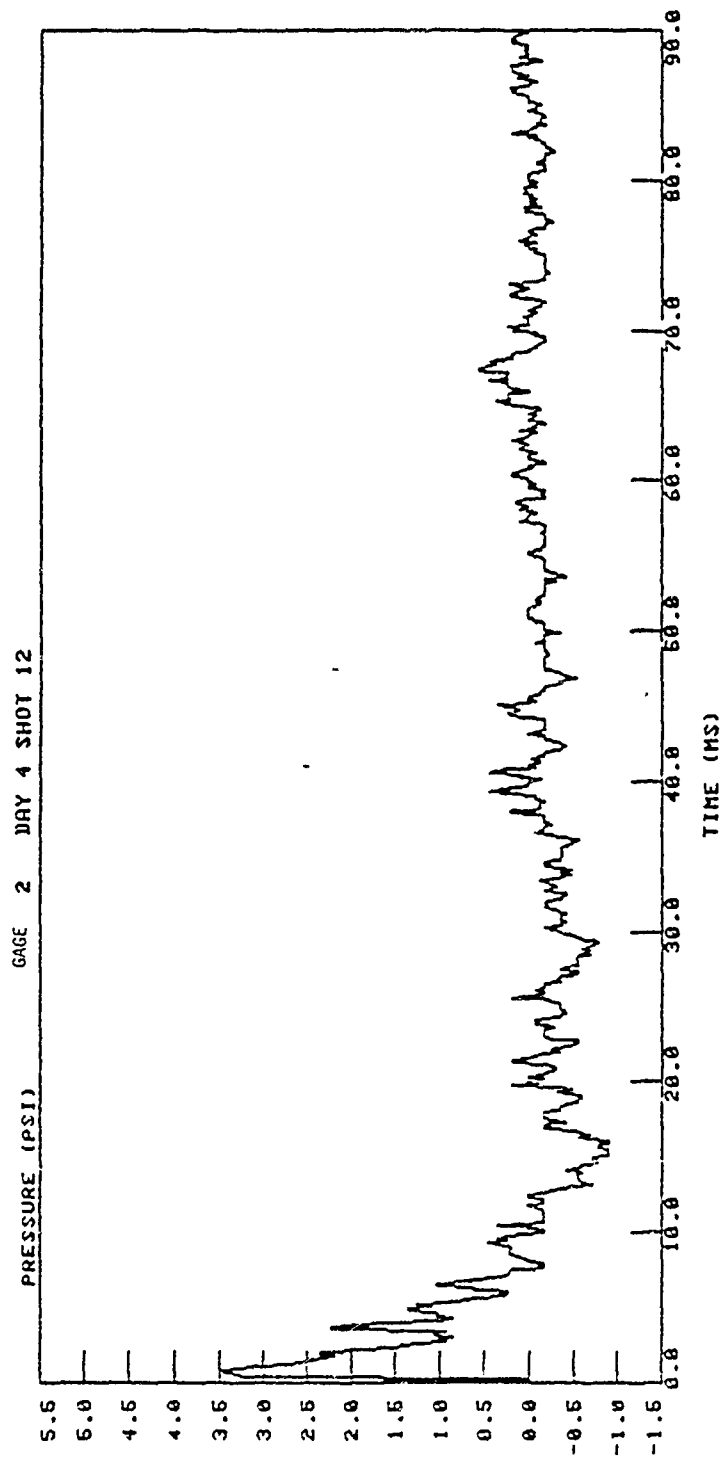


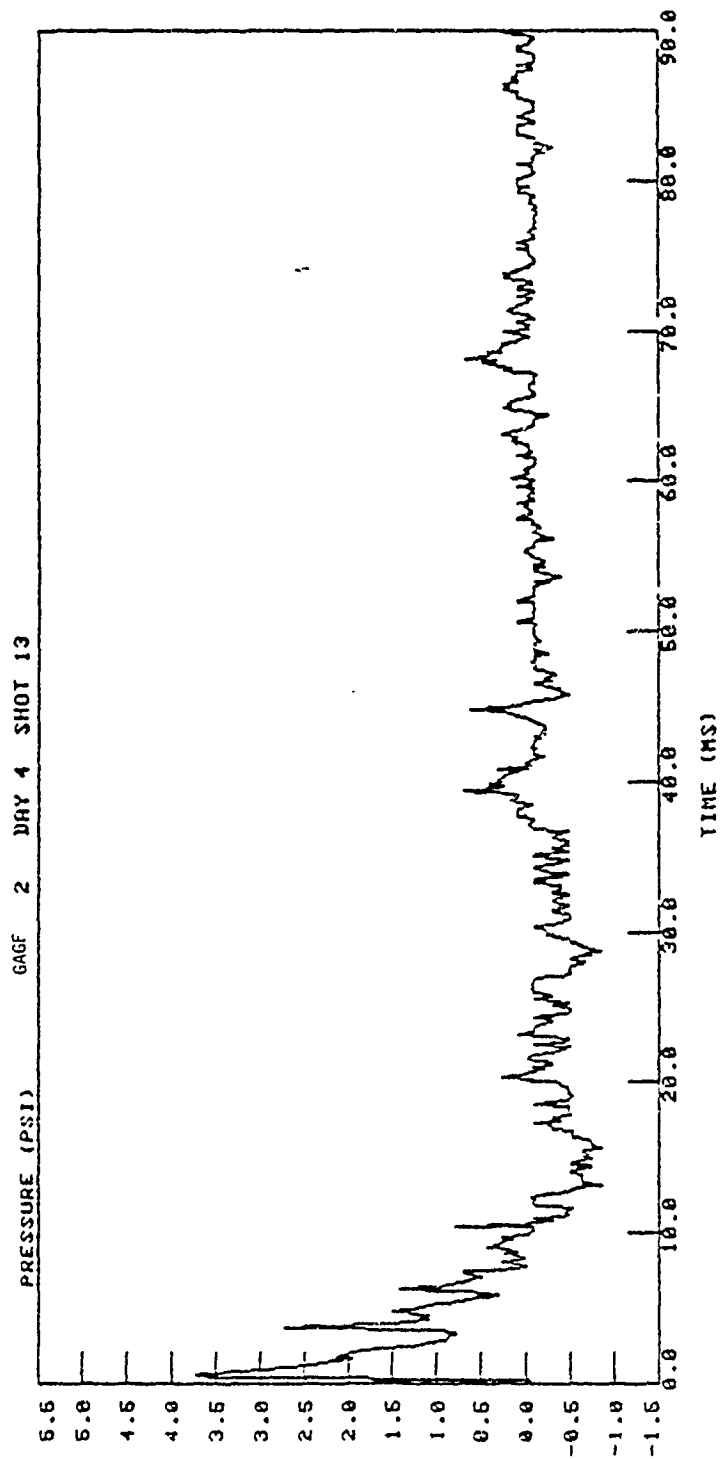


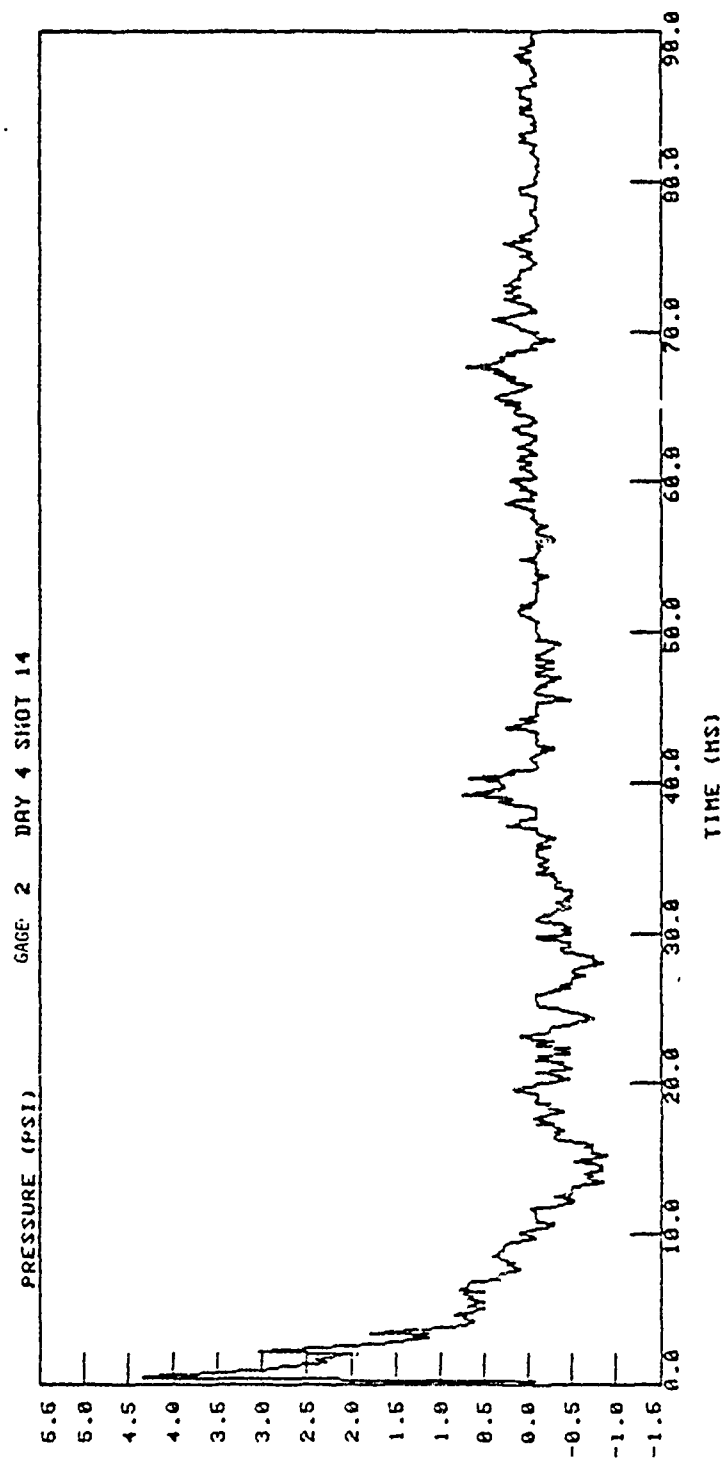


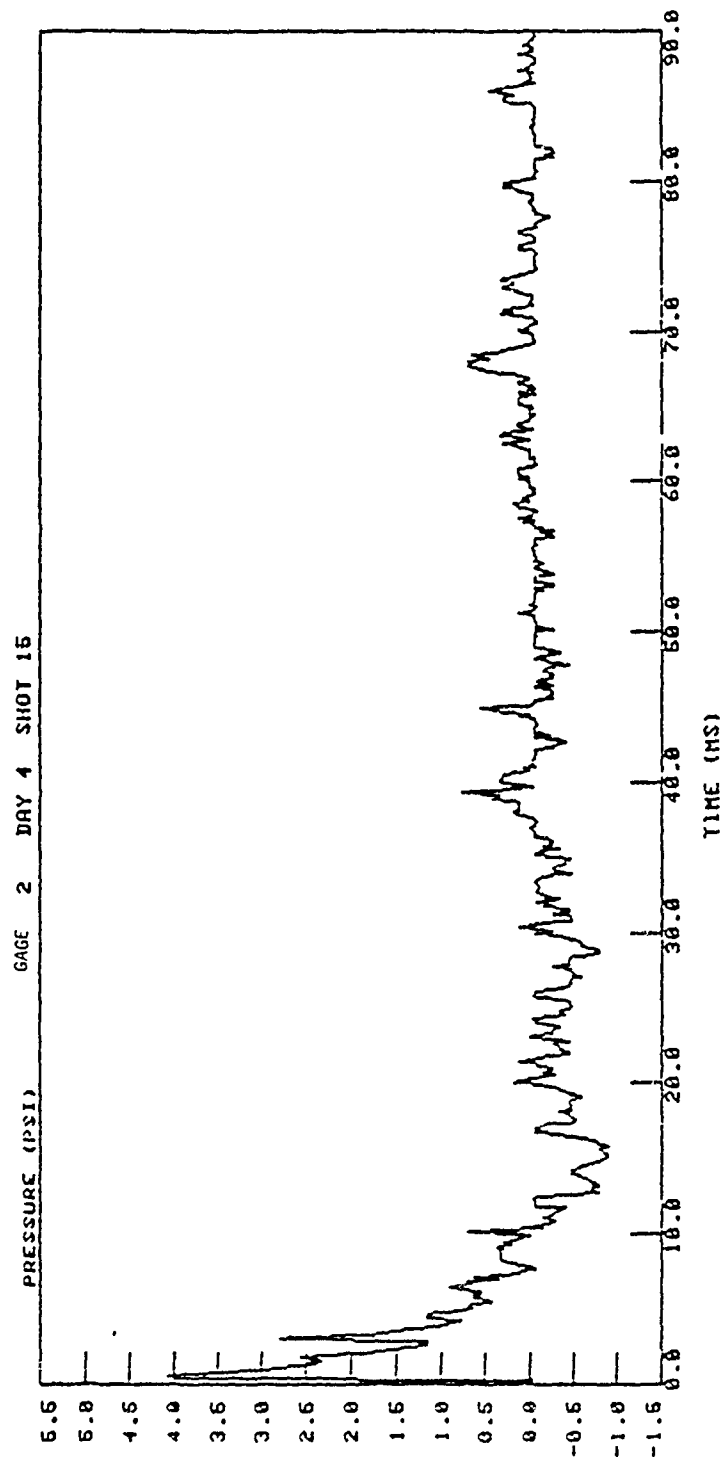


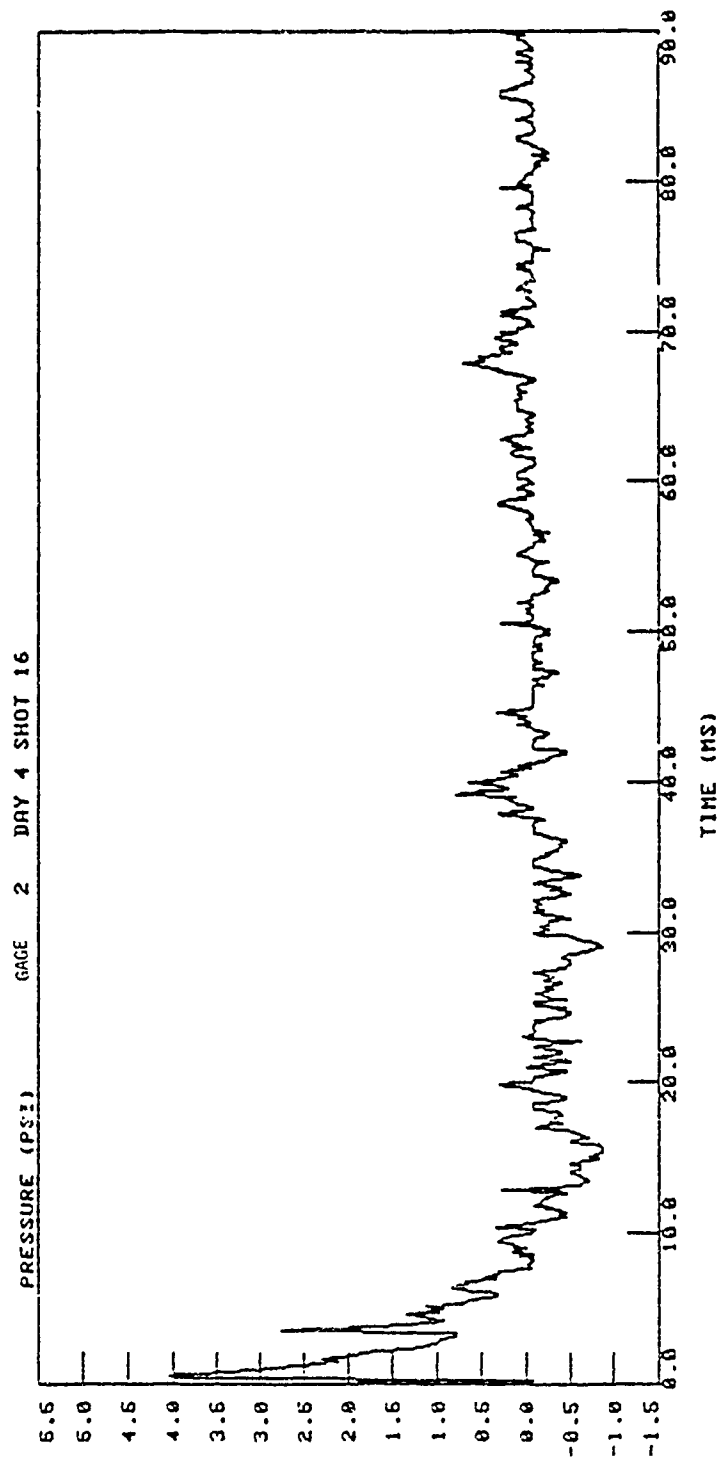


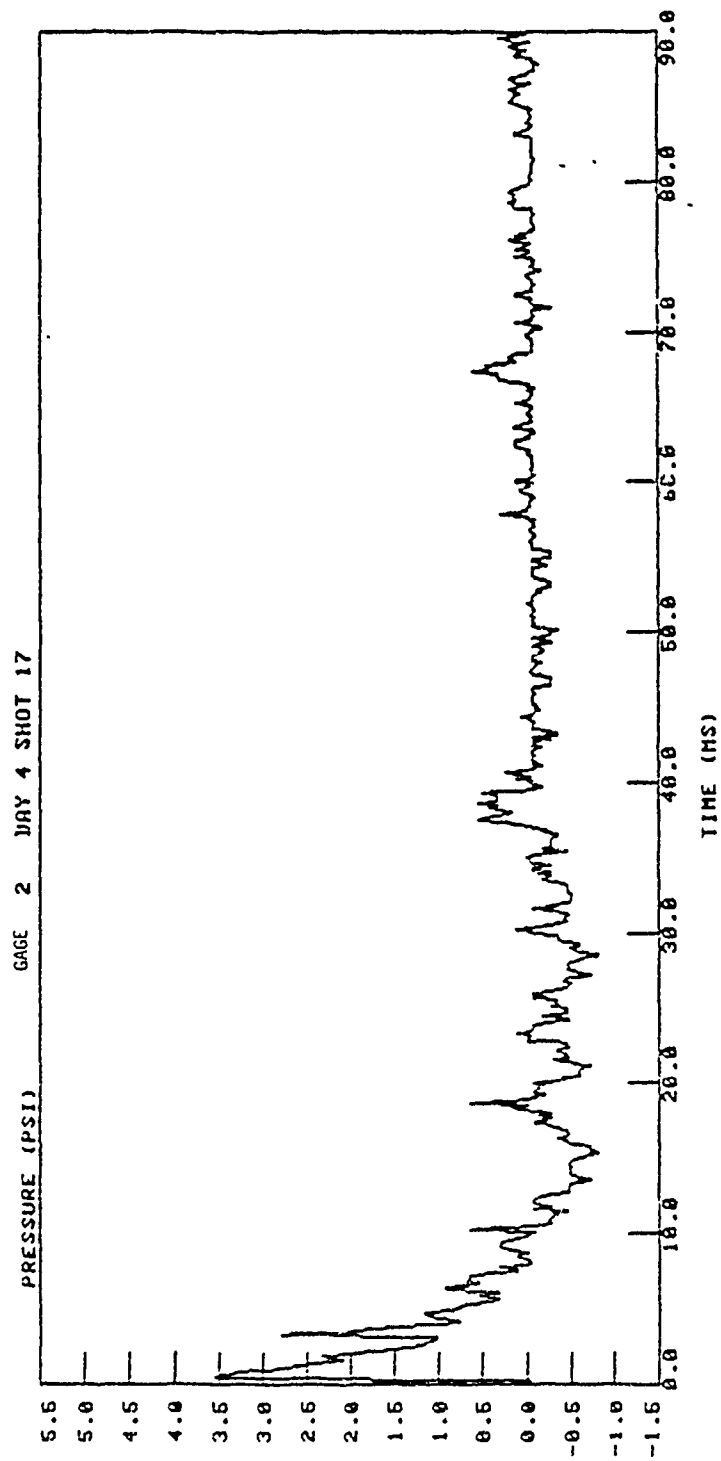


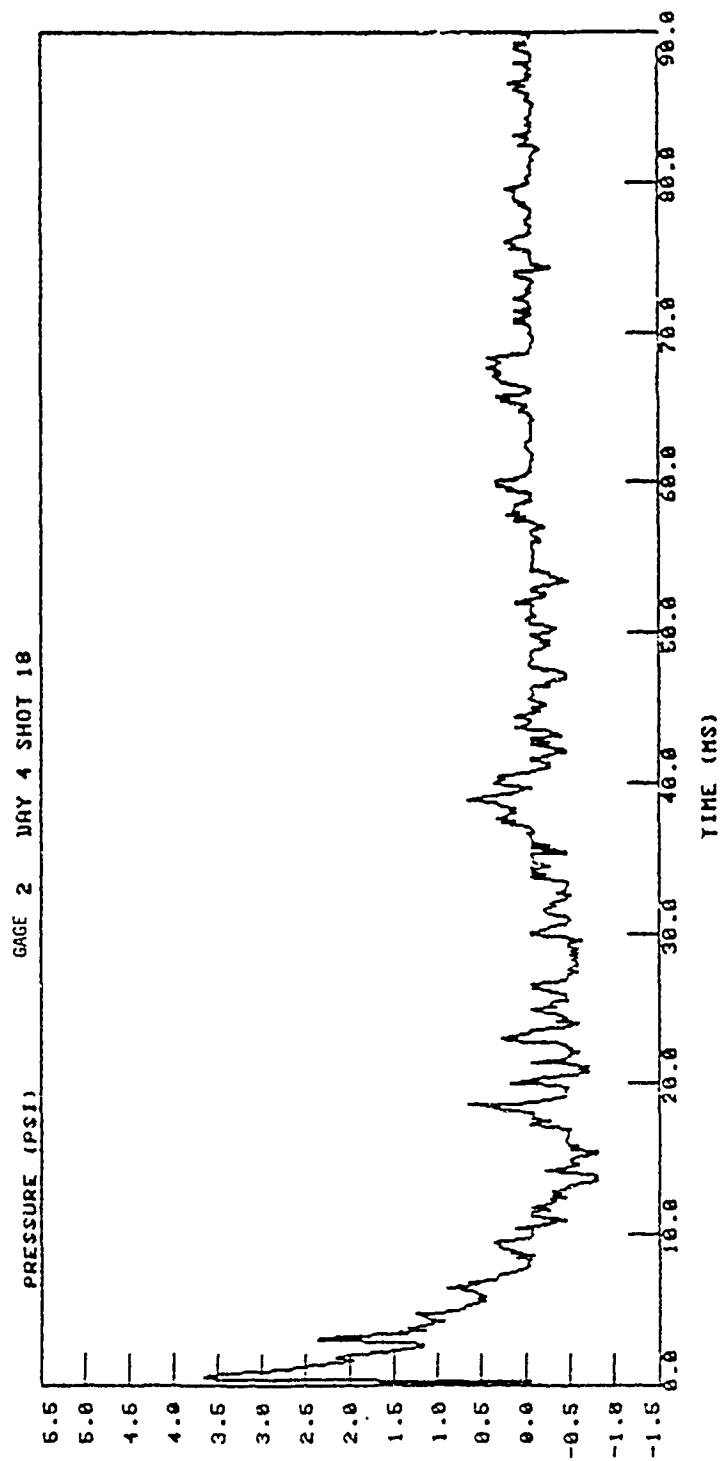


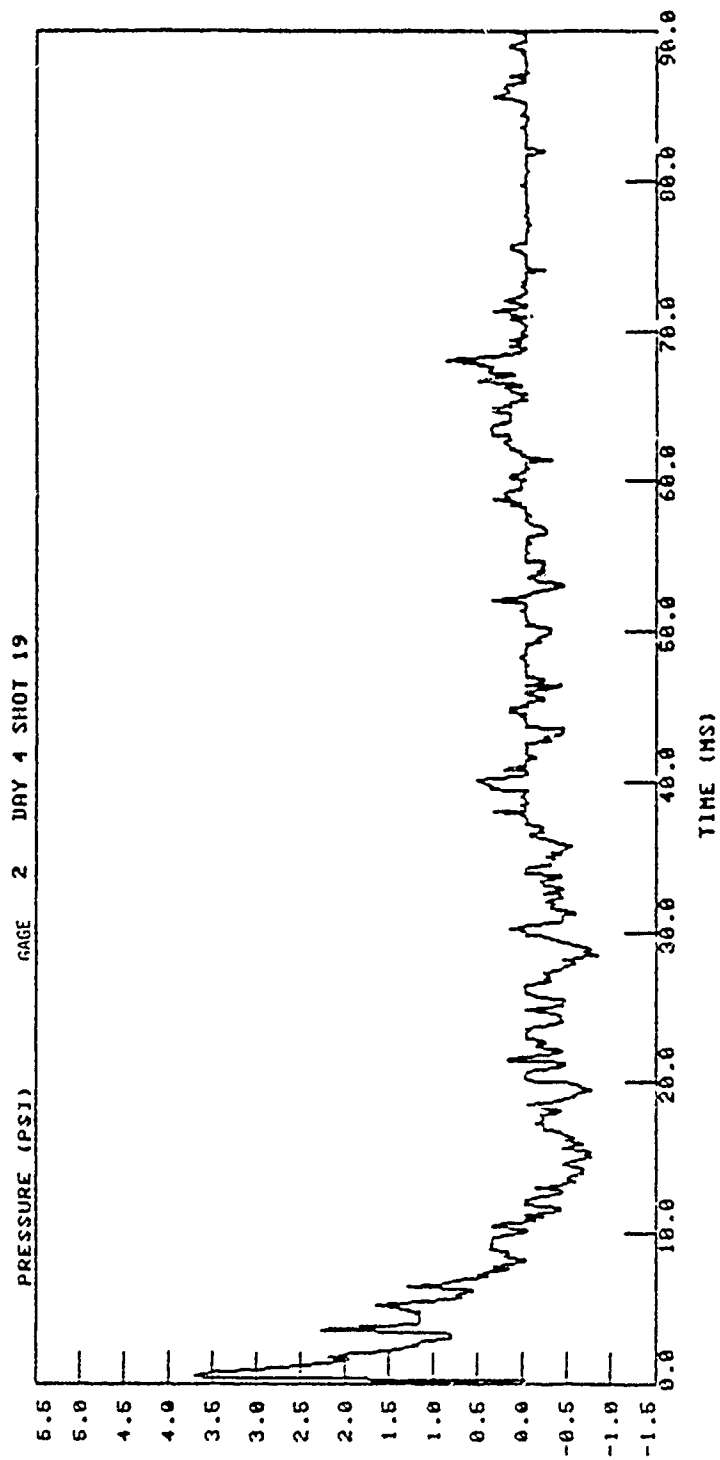


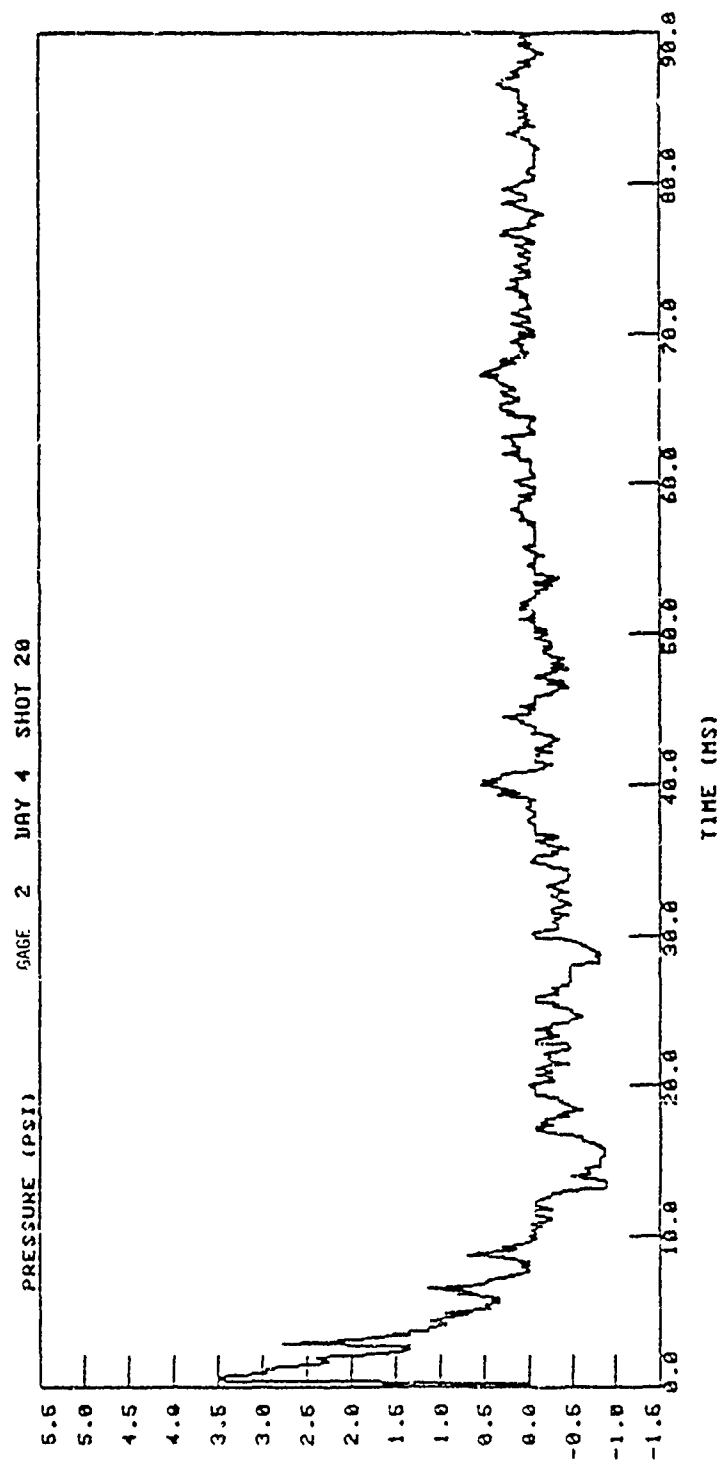


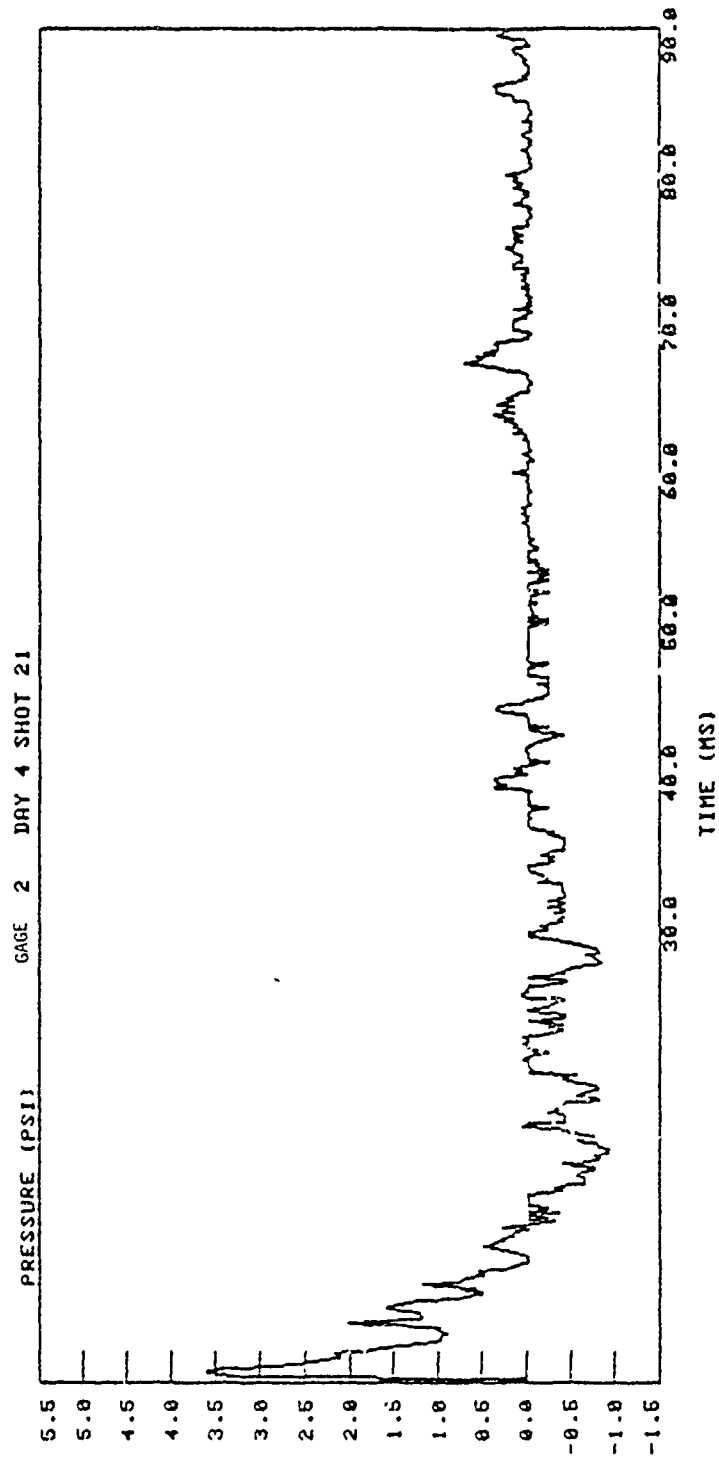


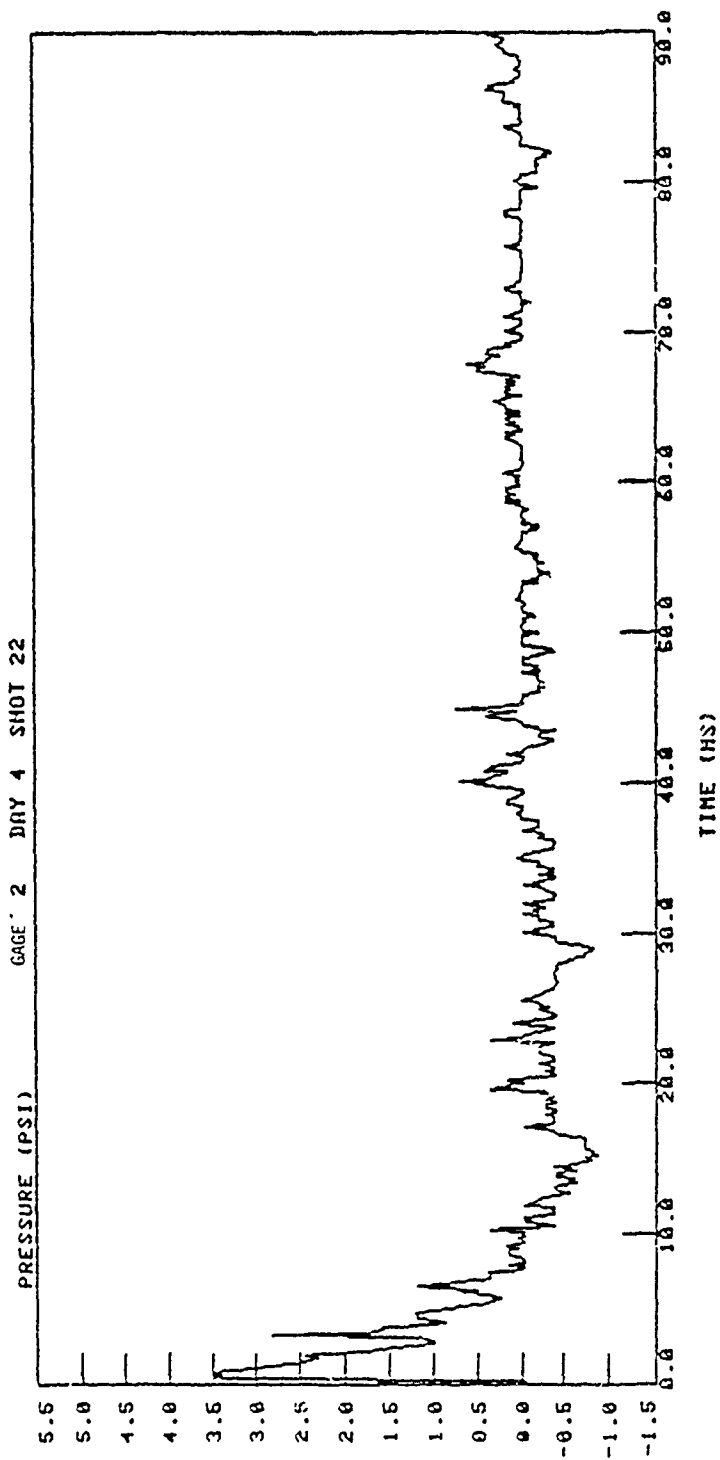


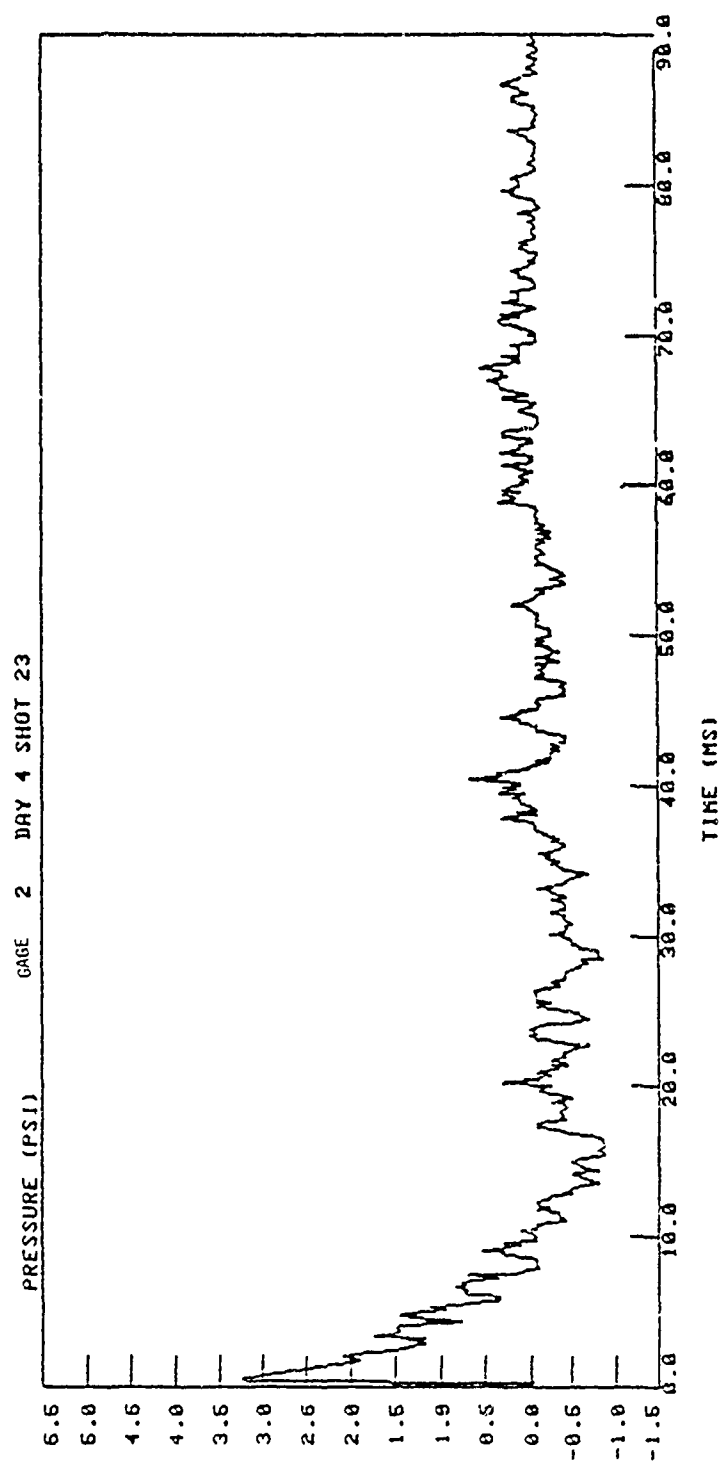


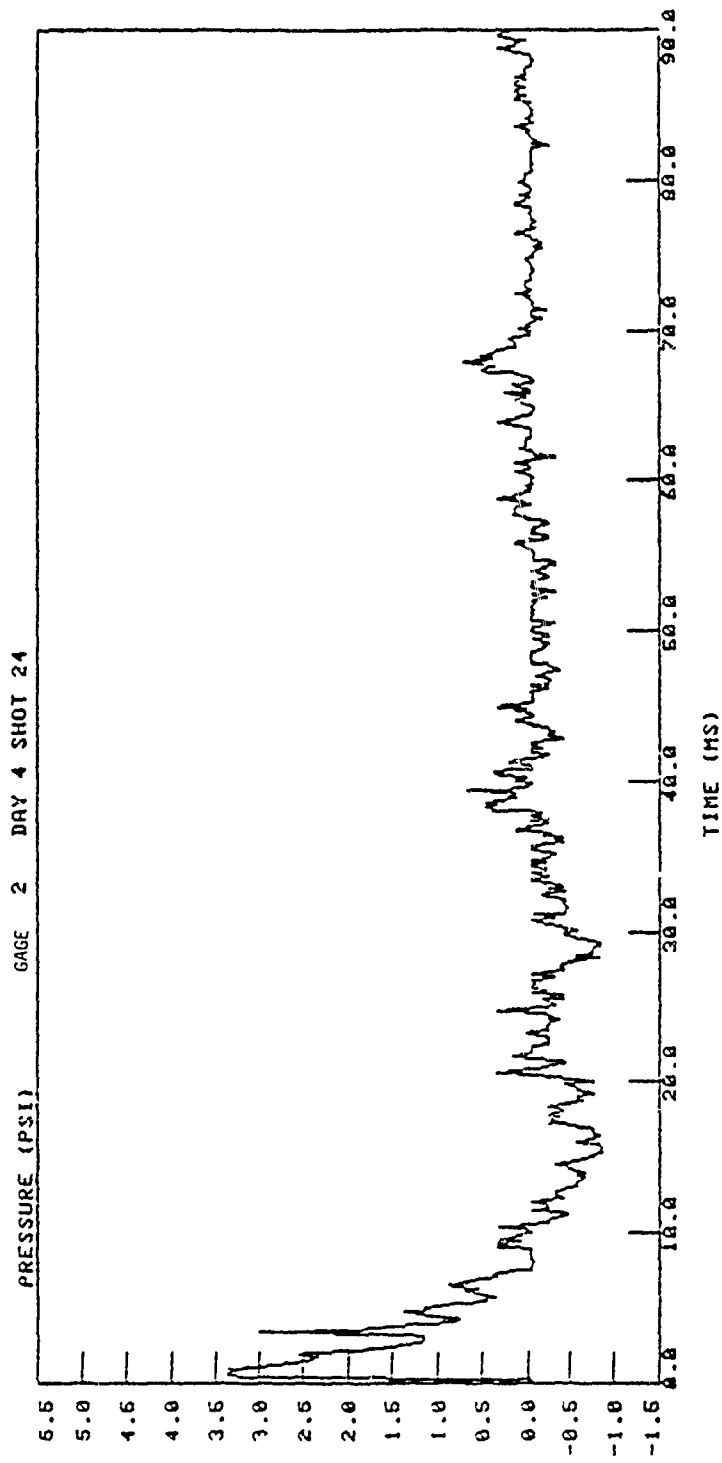


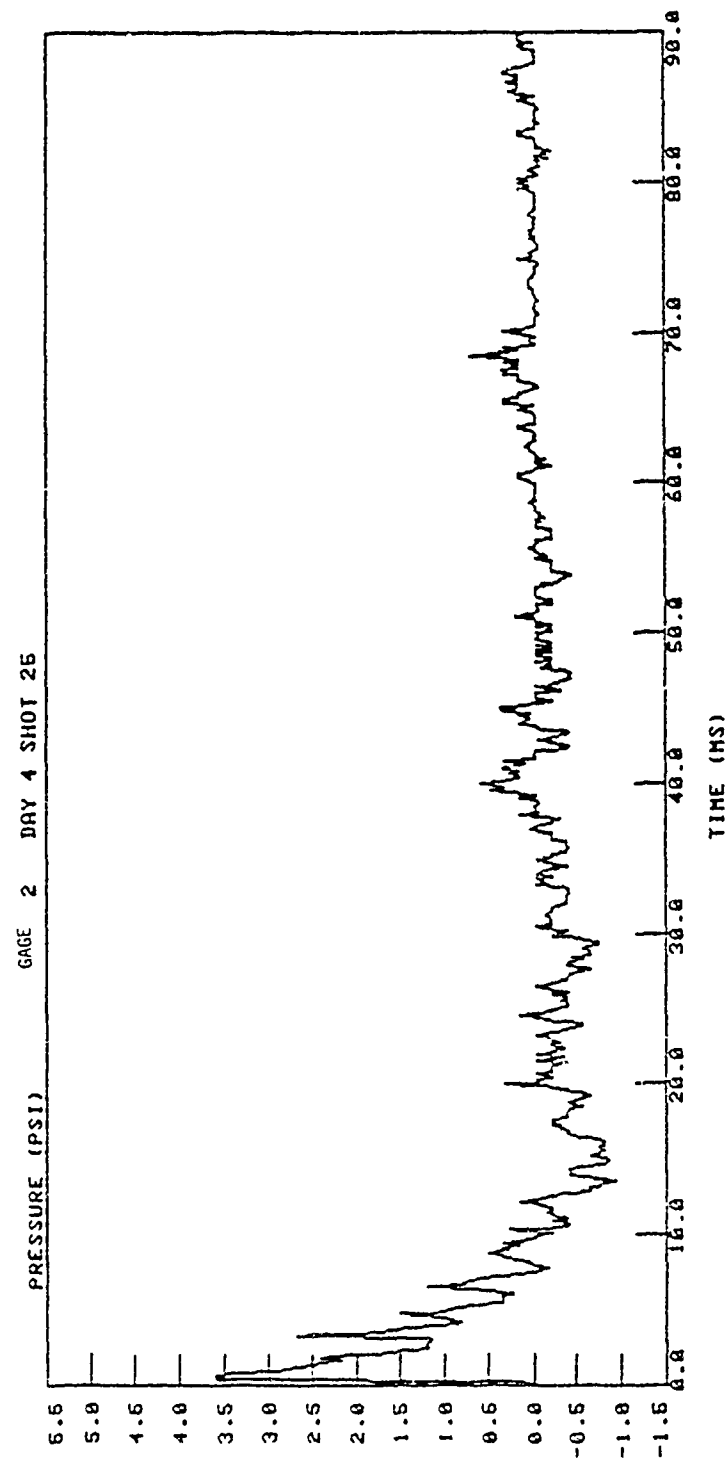


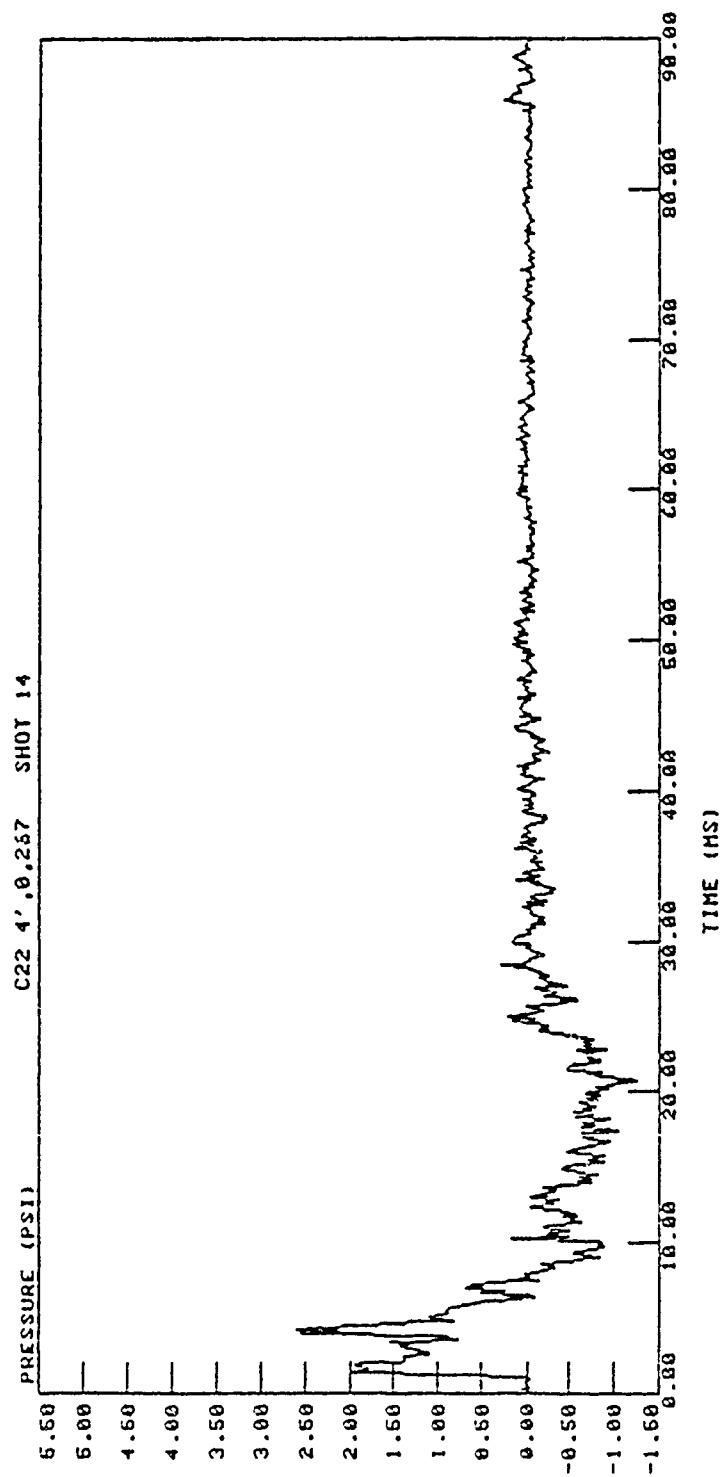


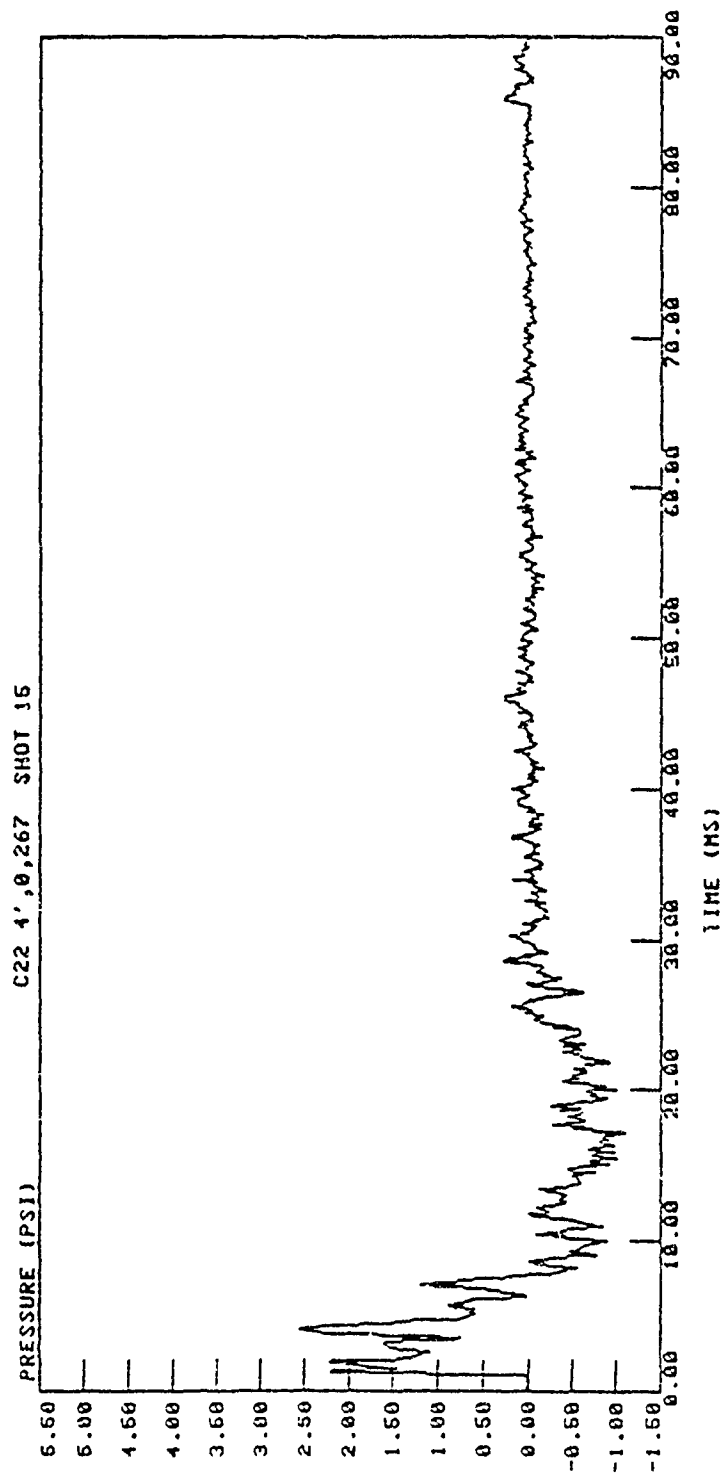


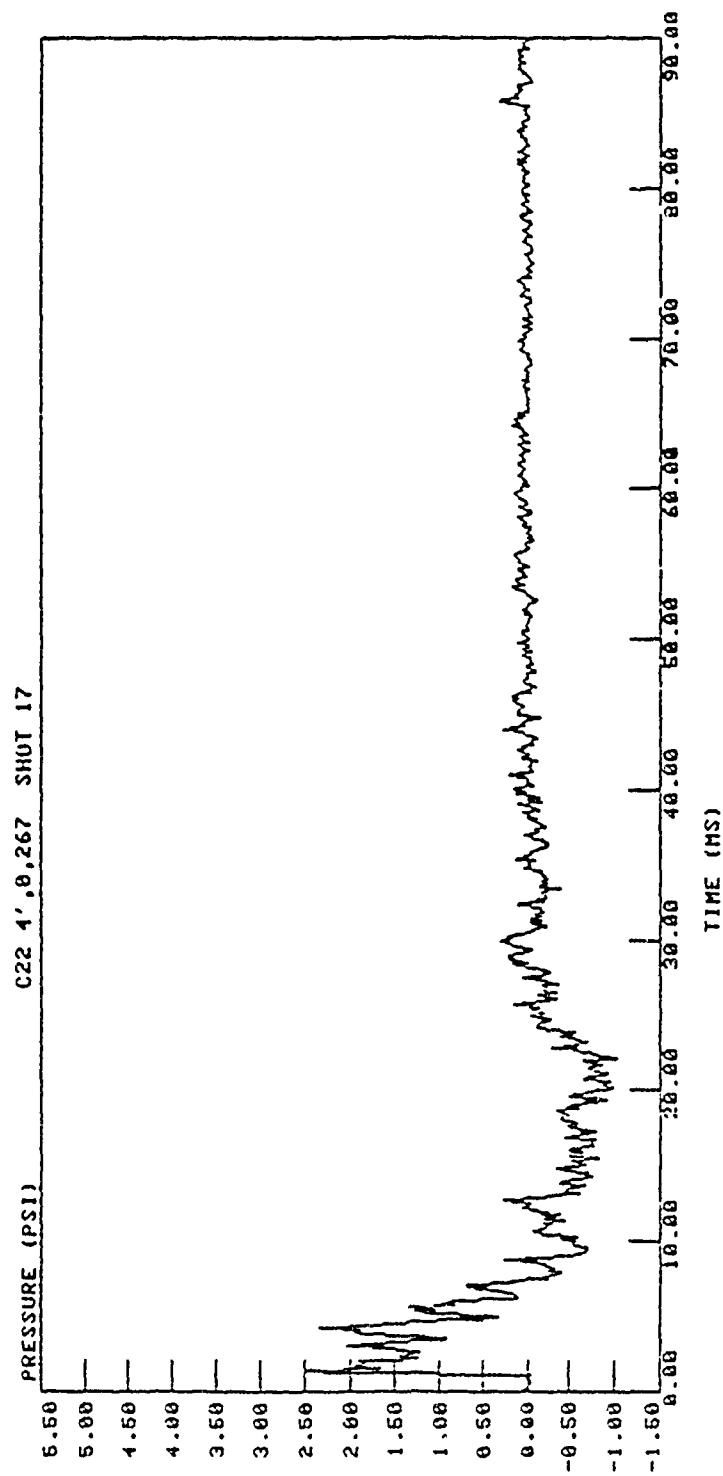


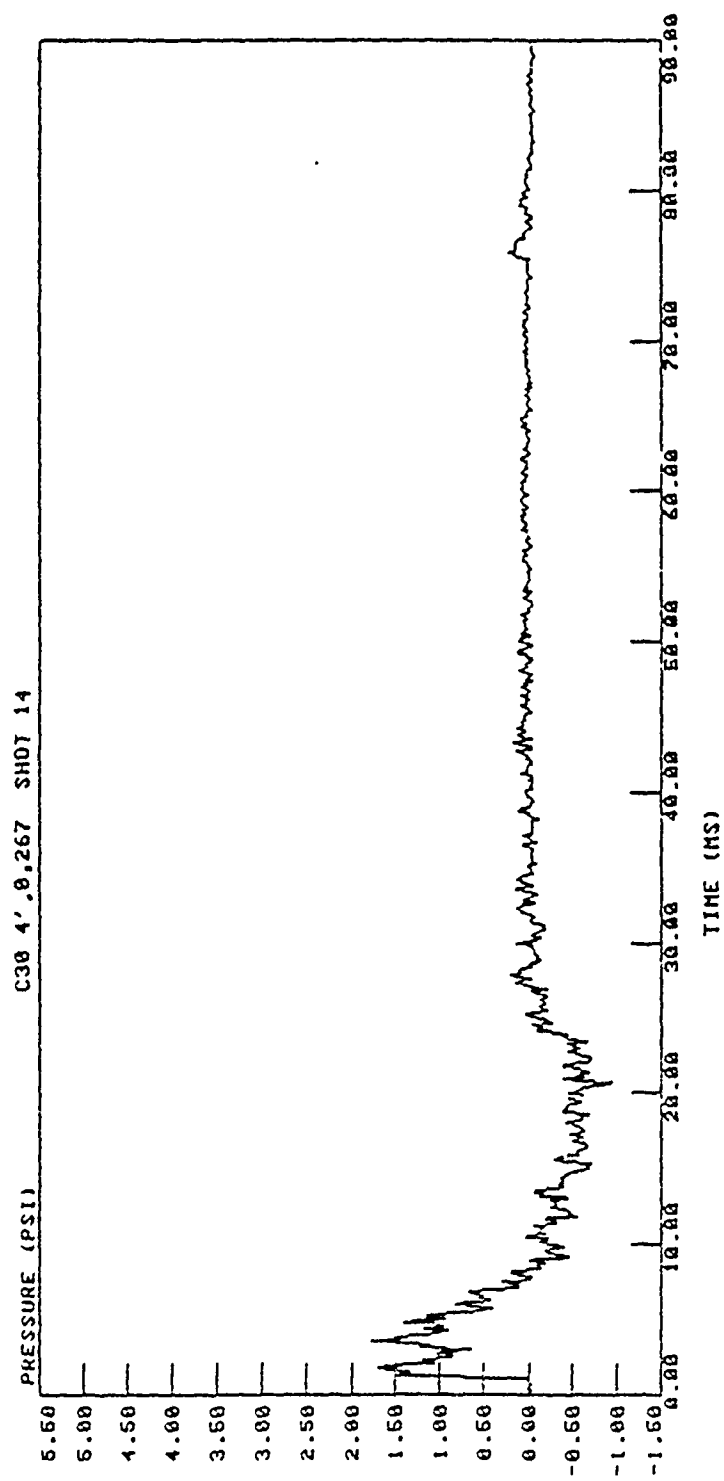


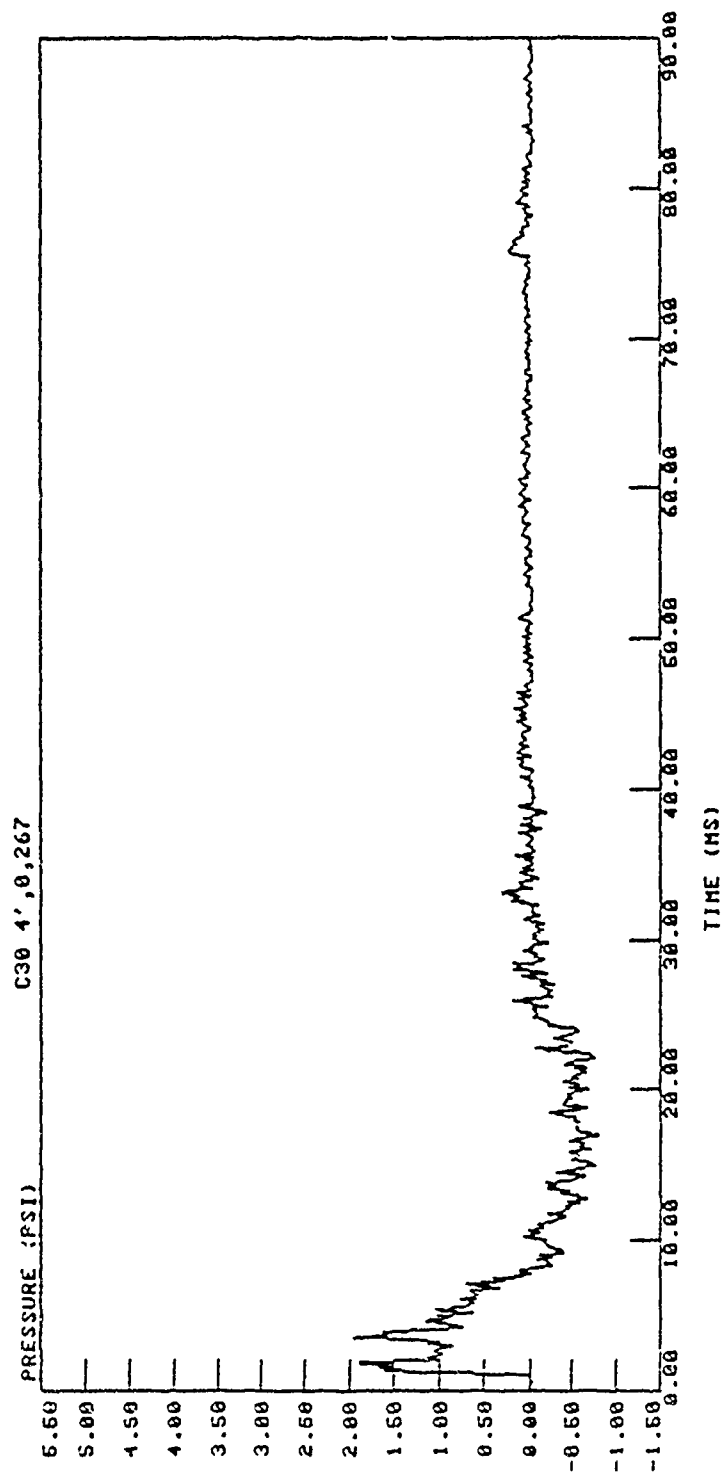


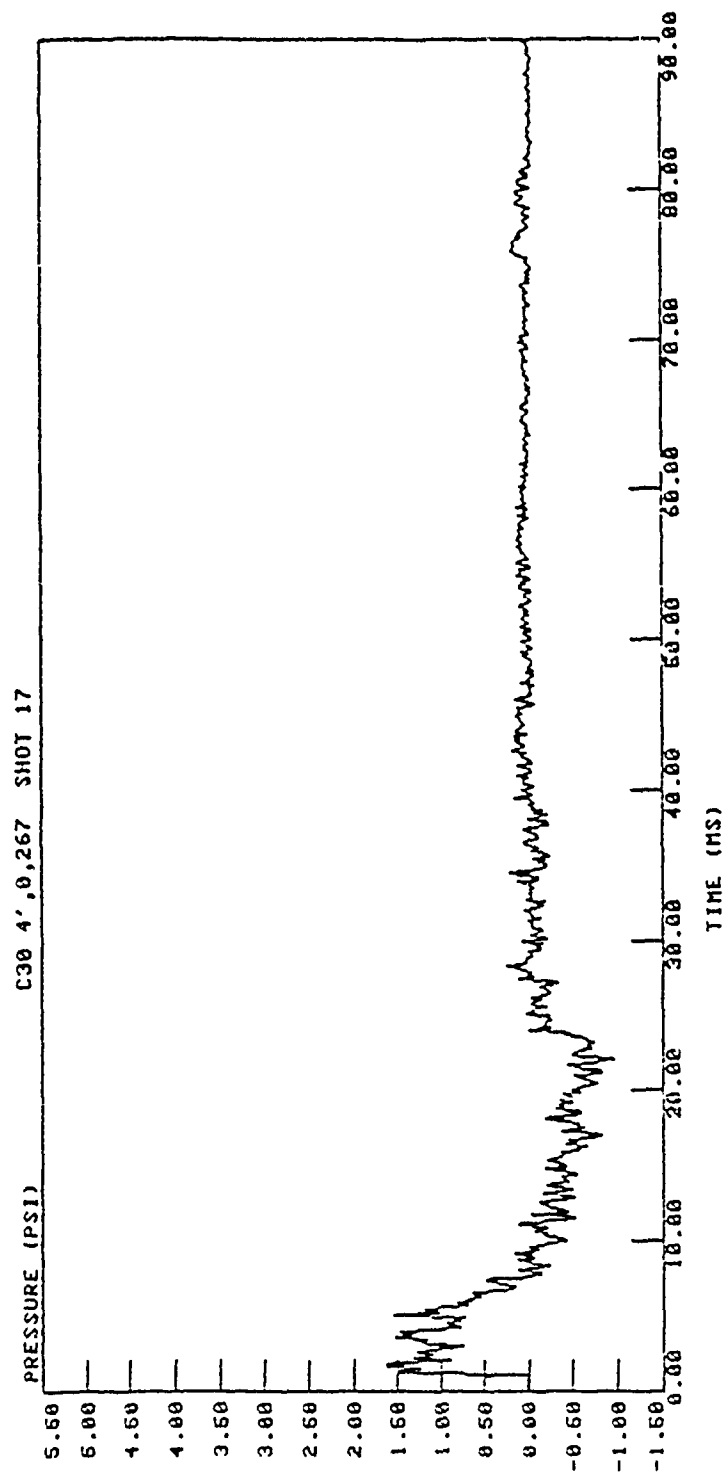


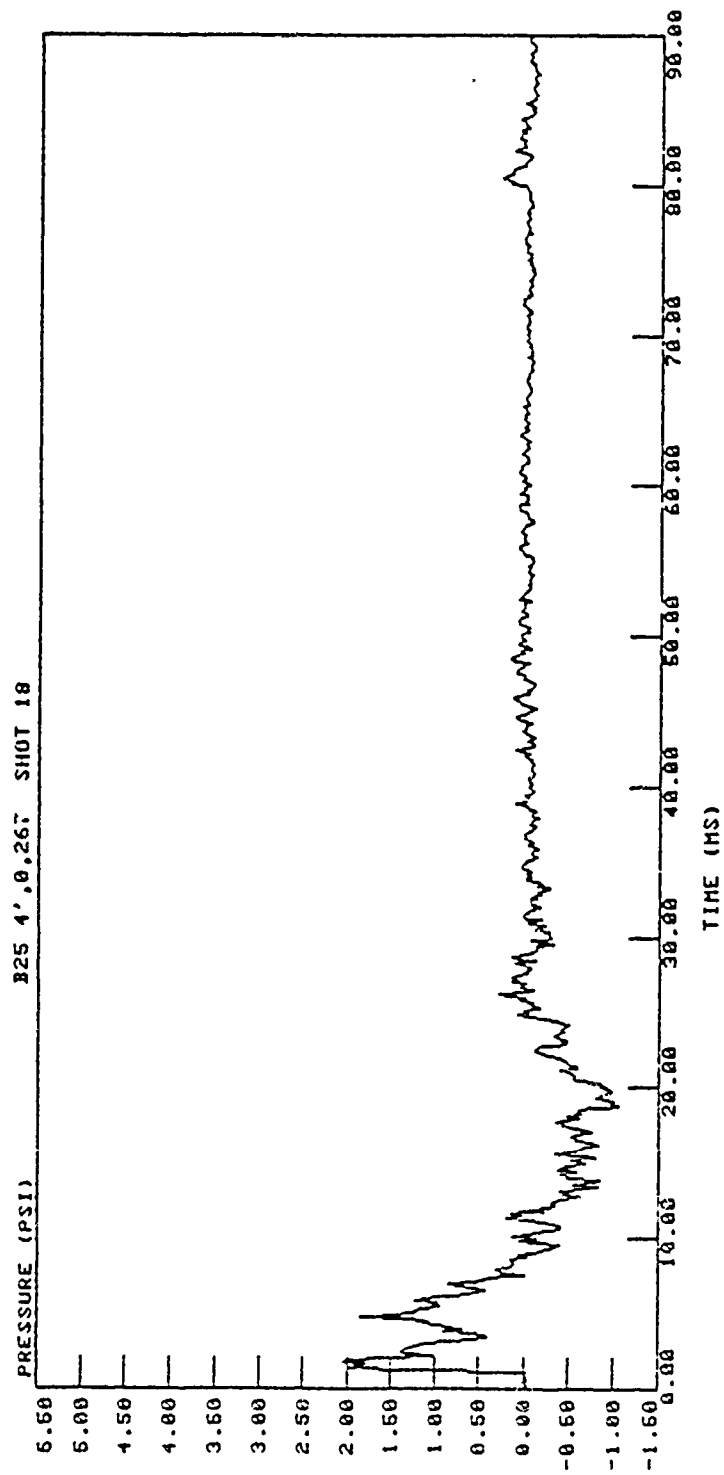


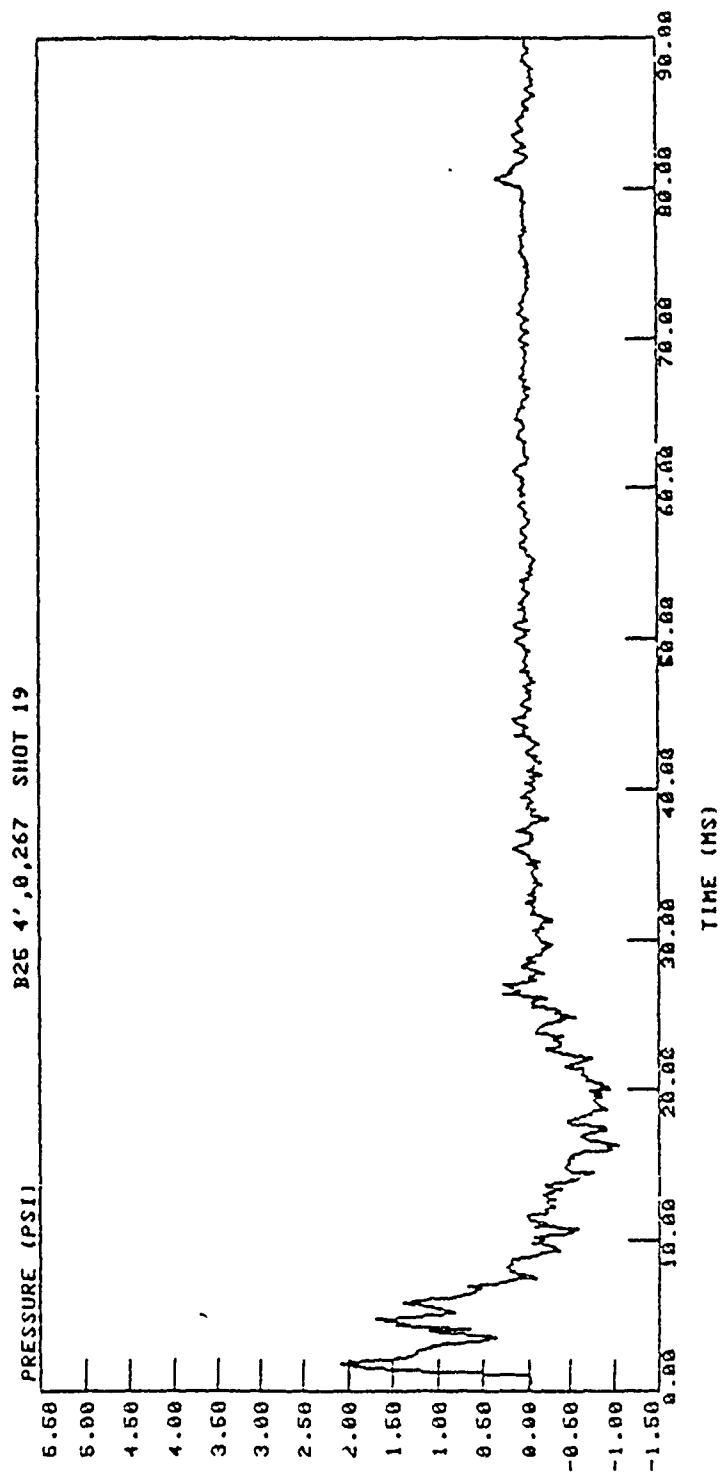


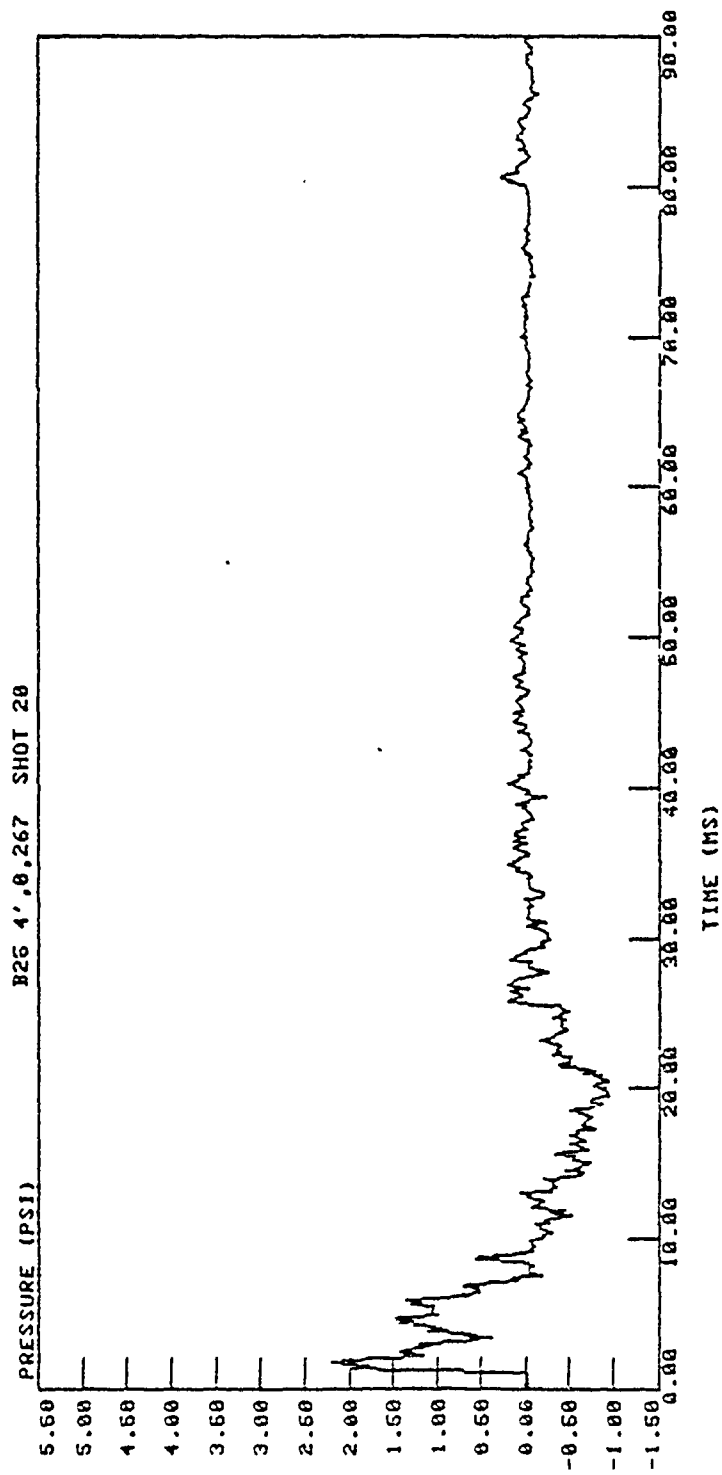


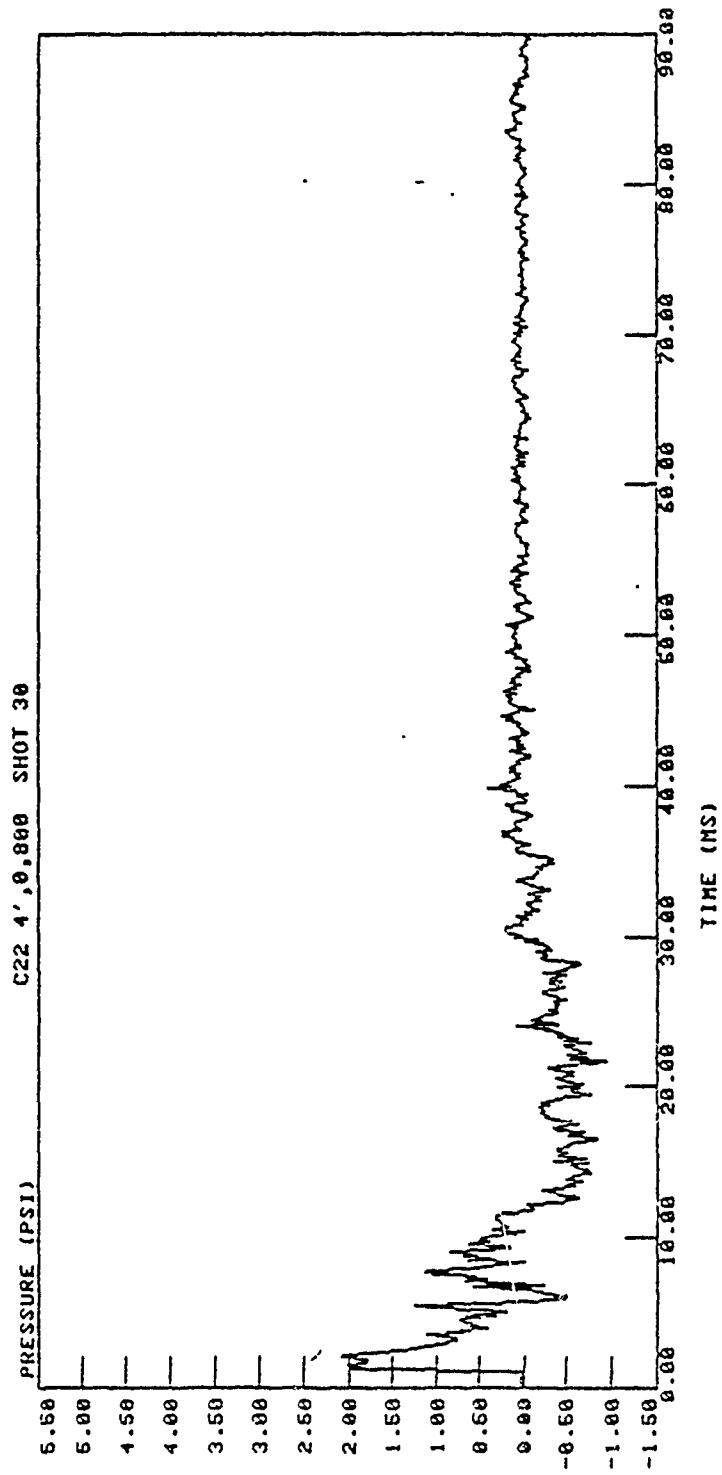


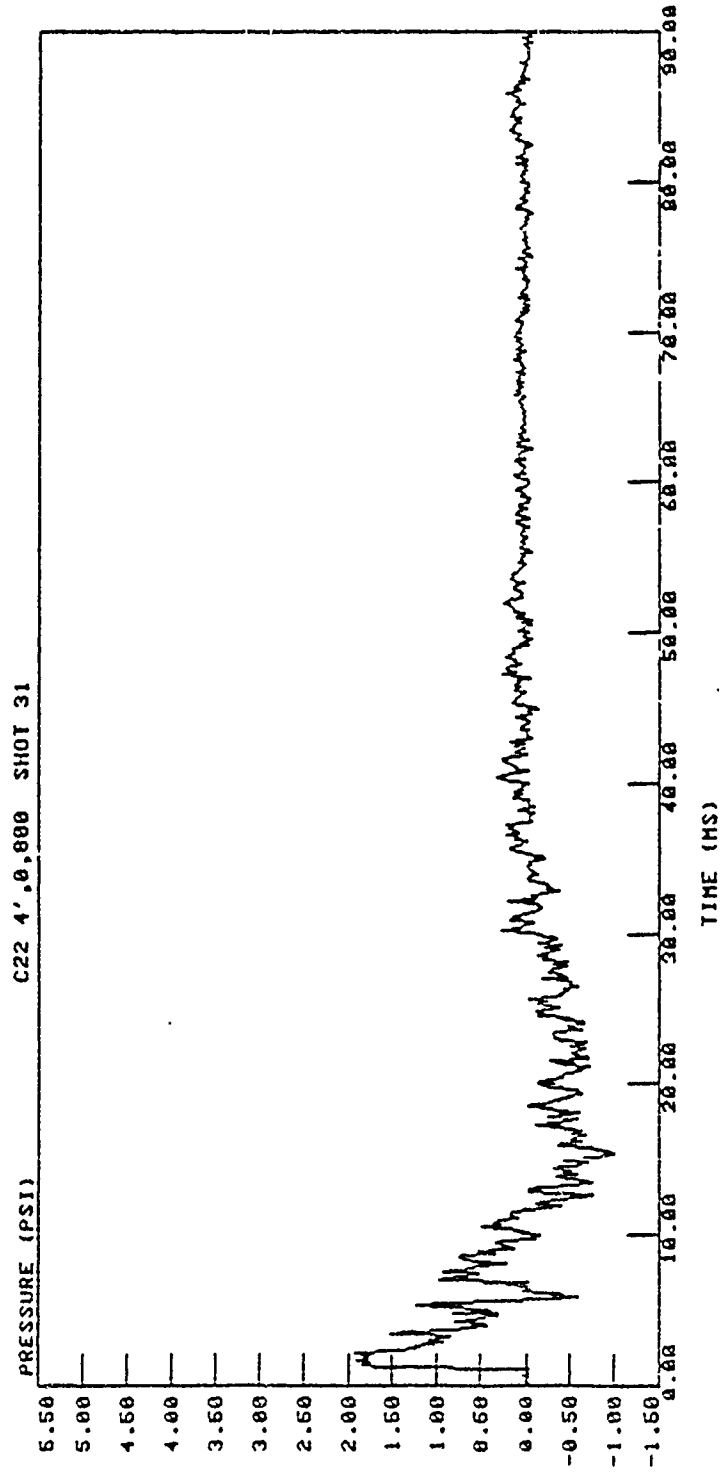


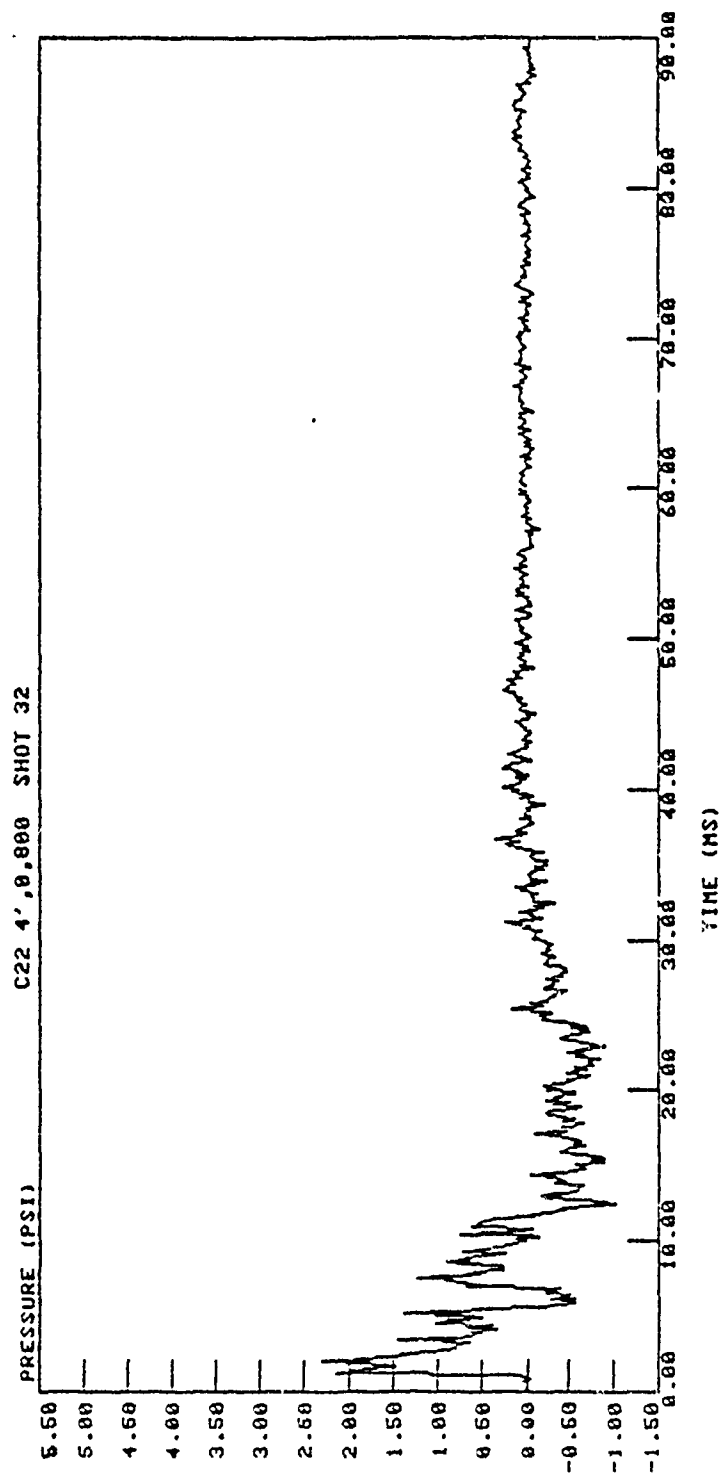


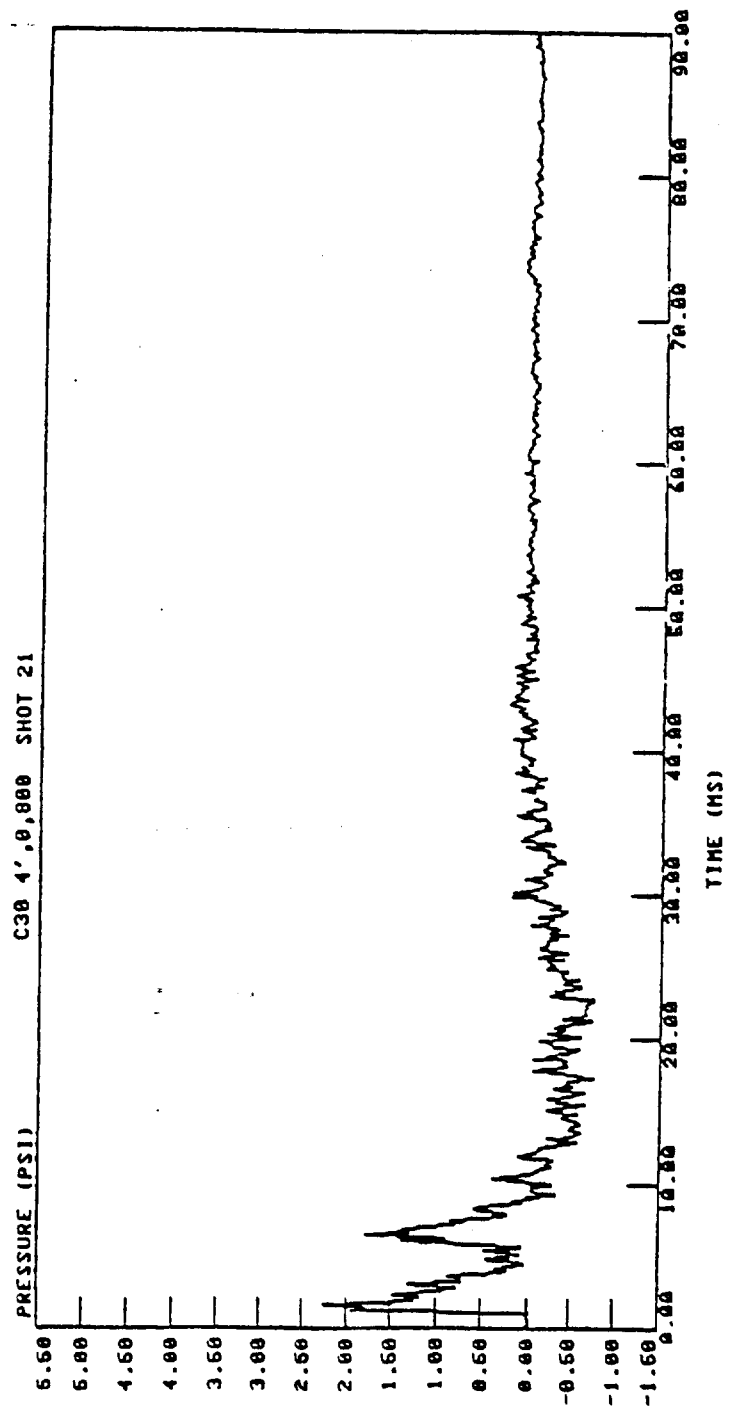


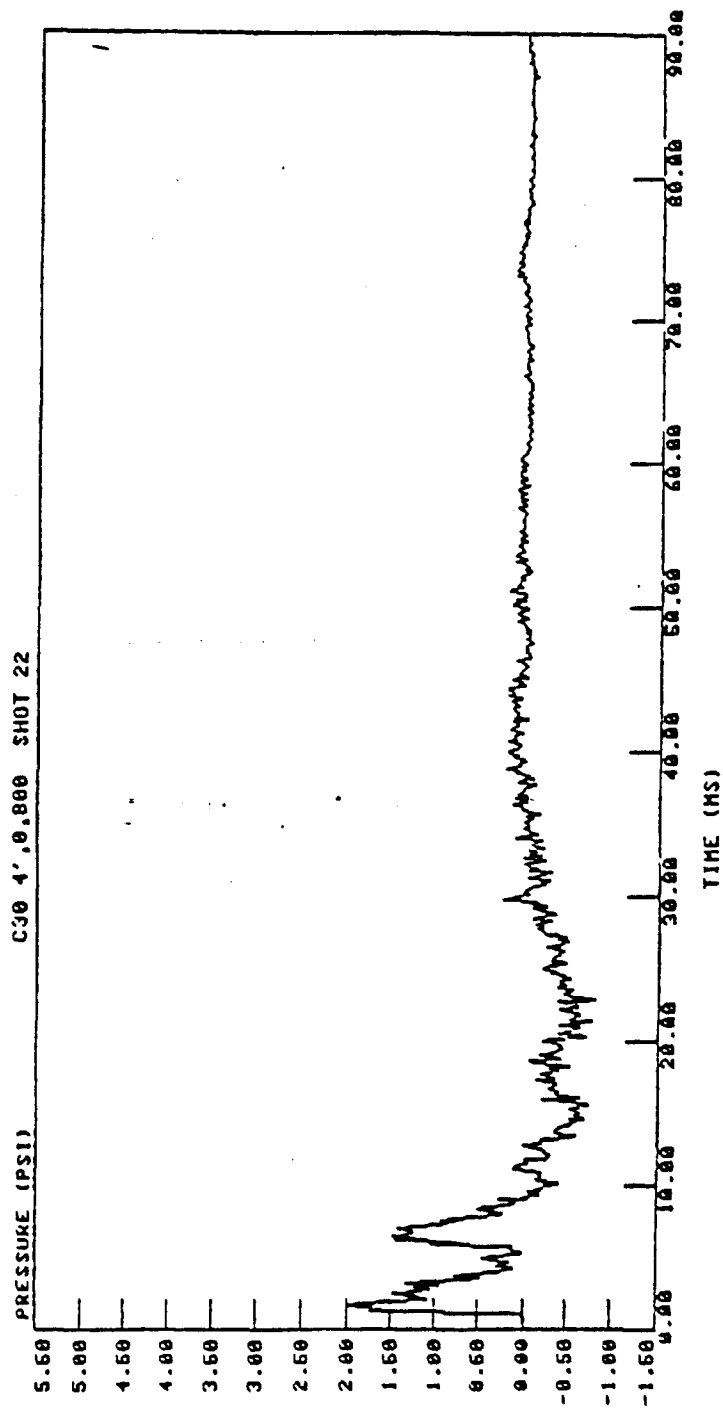


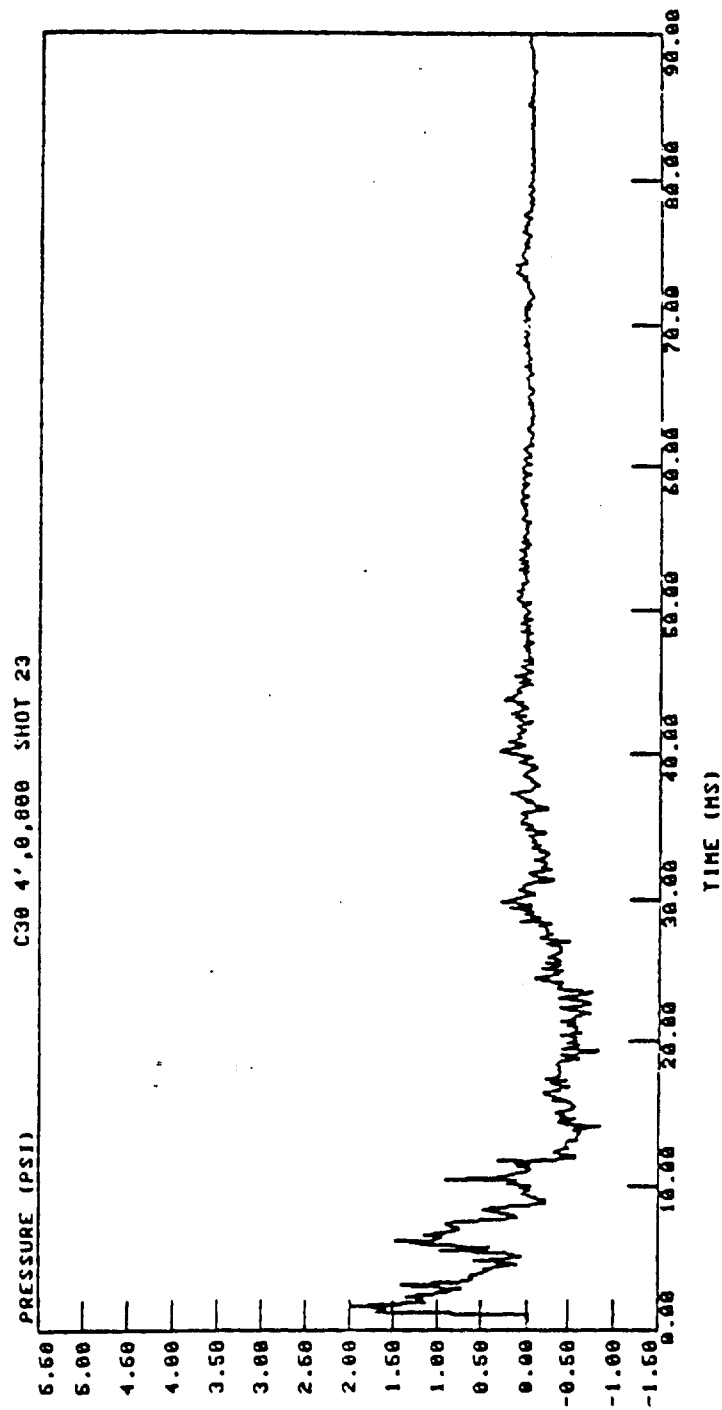


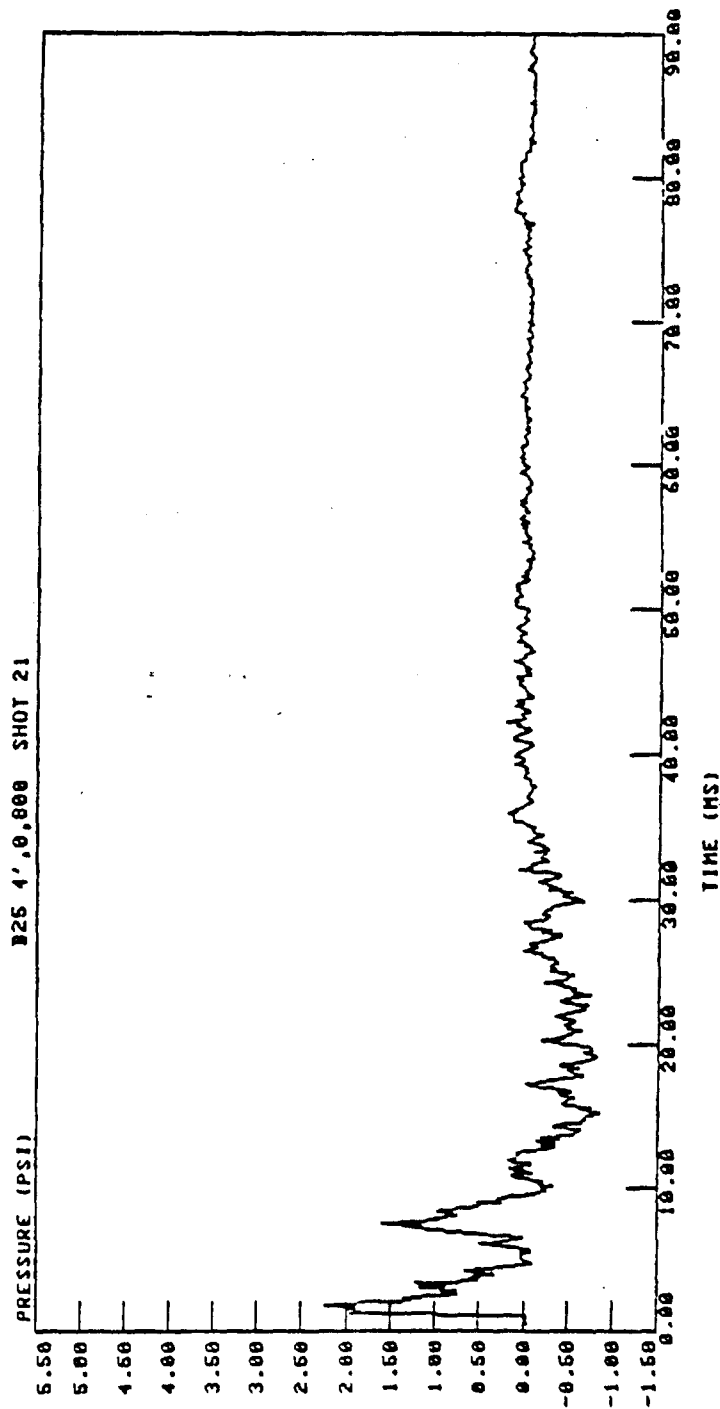


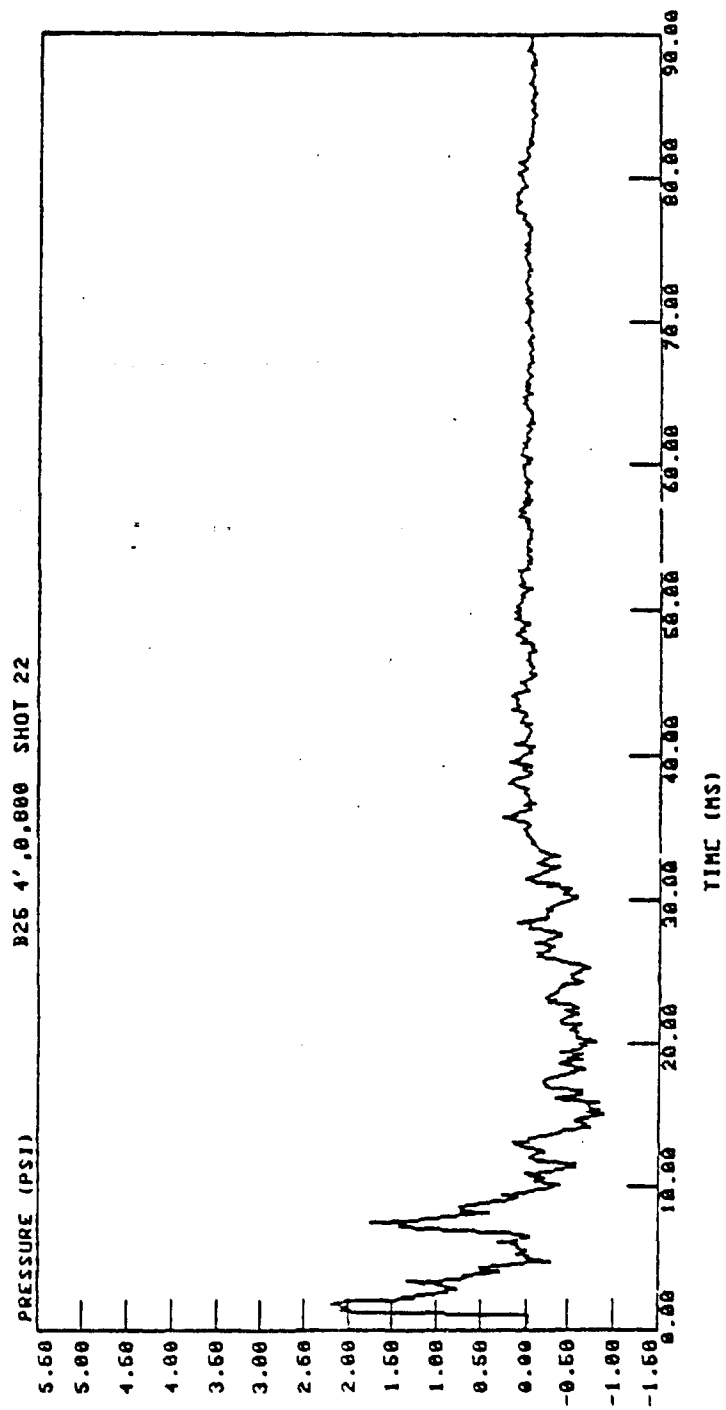


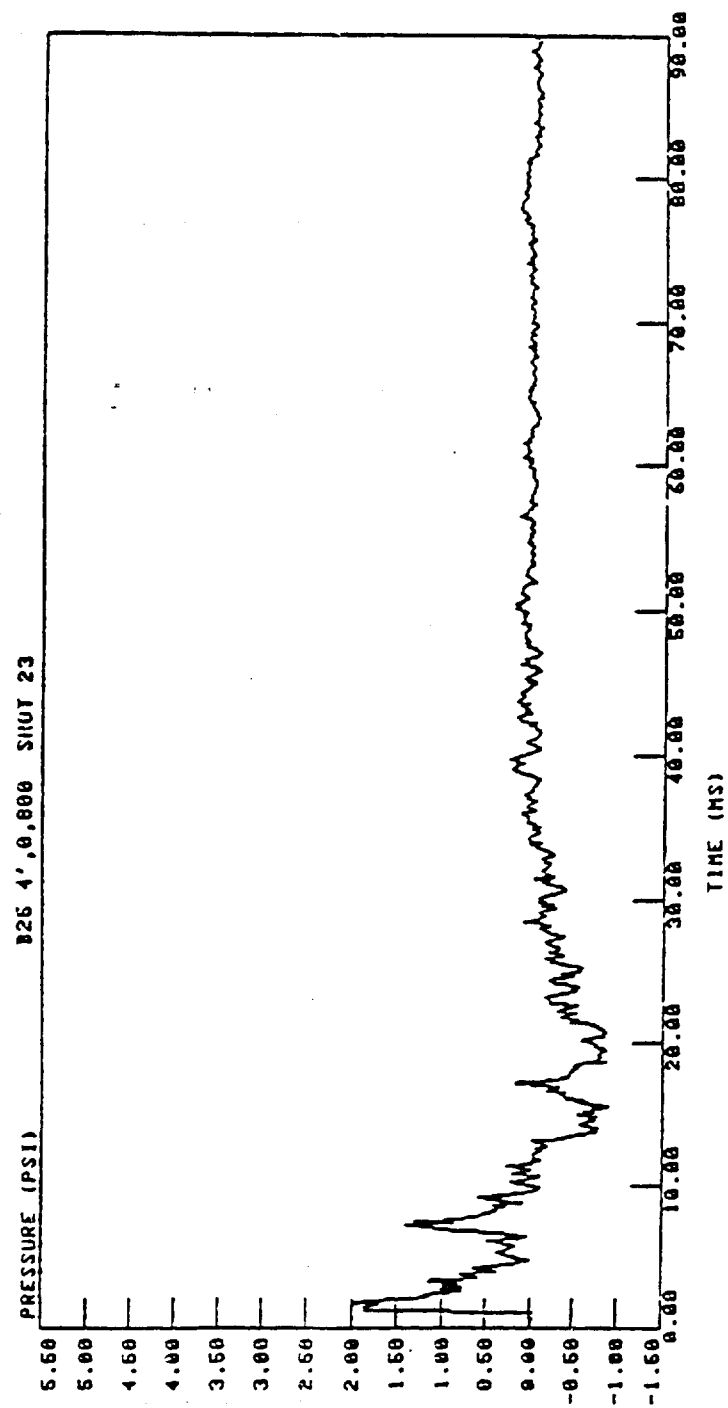


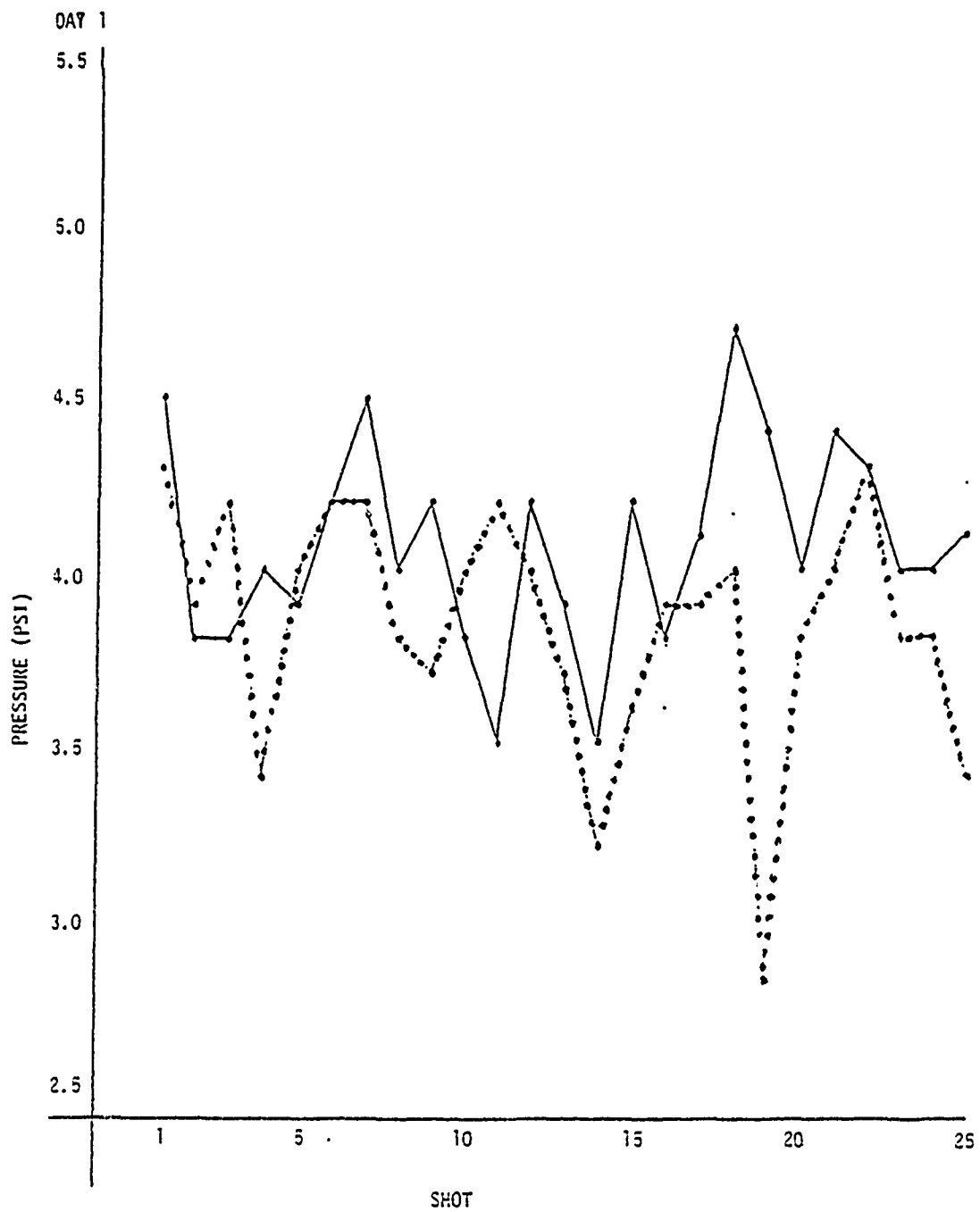










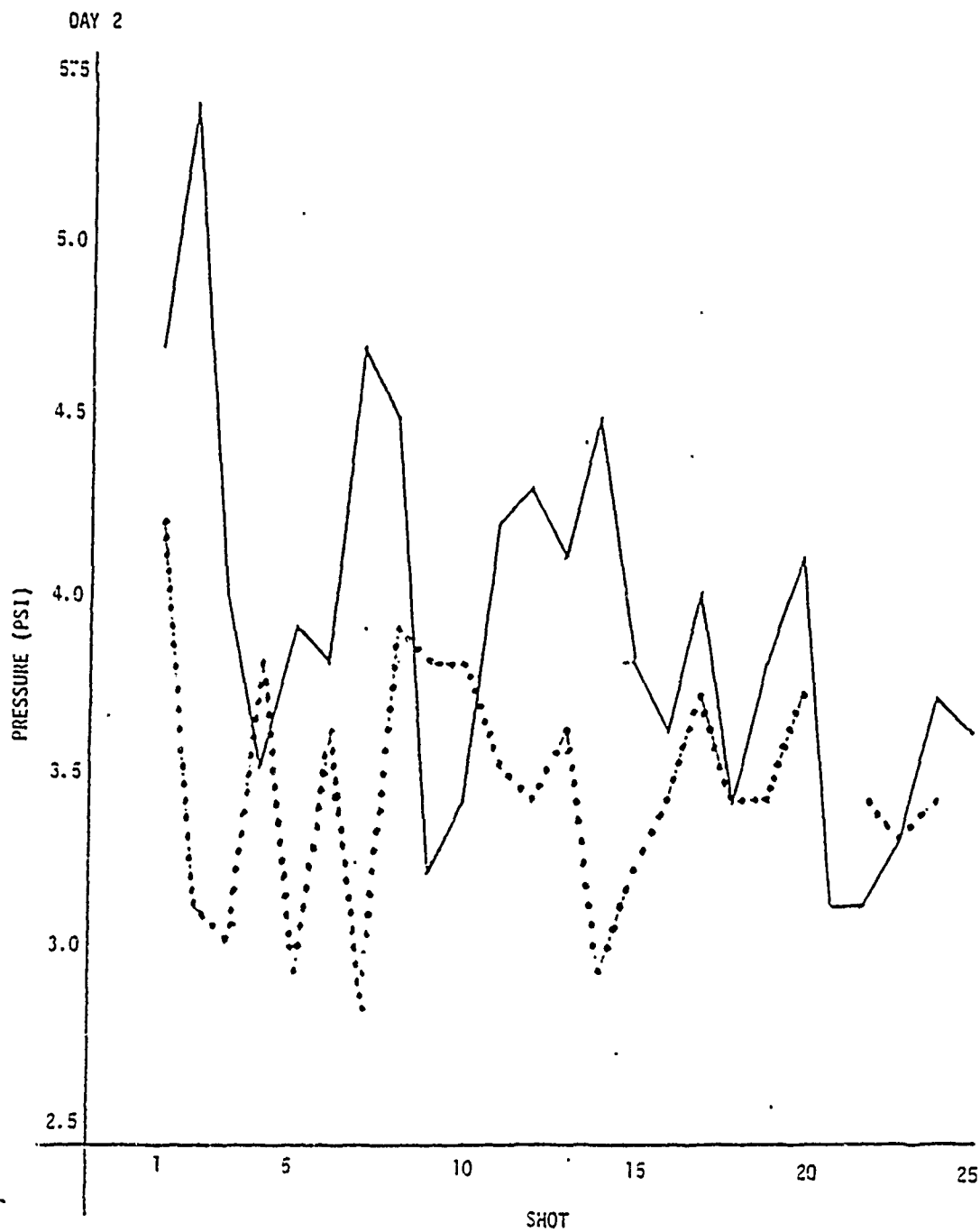


MAXIMUM RECORDED OVERPRESSURE

Taken From 80K Records with Pulse Calibration

GAGE 2 —————

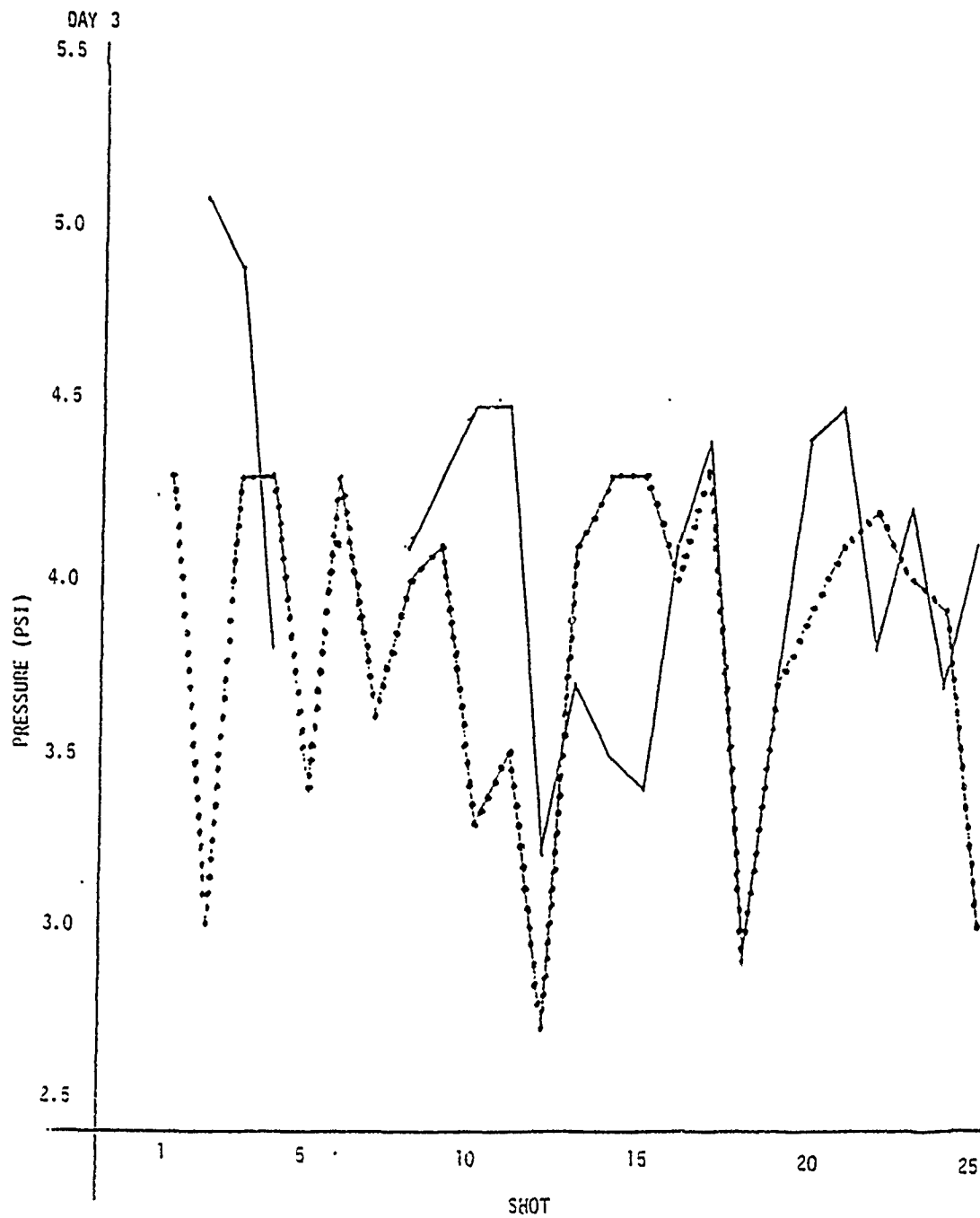
GAGE 4 • • • • •



MAXIMUM RECORDED OVERPRESSURE

Taken From 80K Records With Pulse Calibration

GAGE 2 —————
GAGE 4 • • • • •

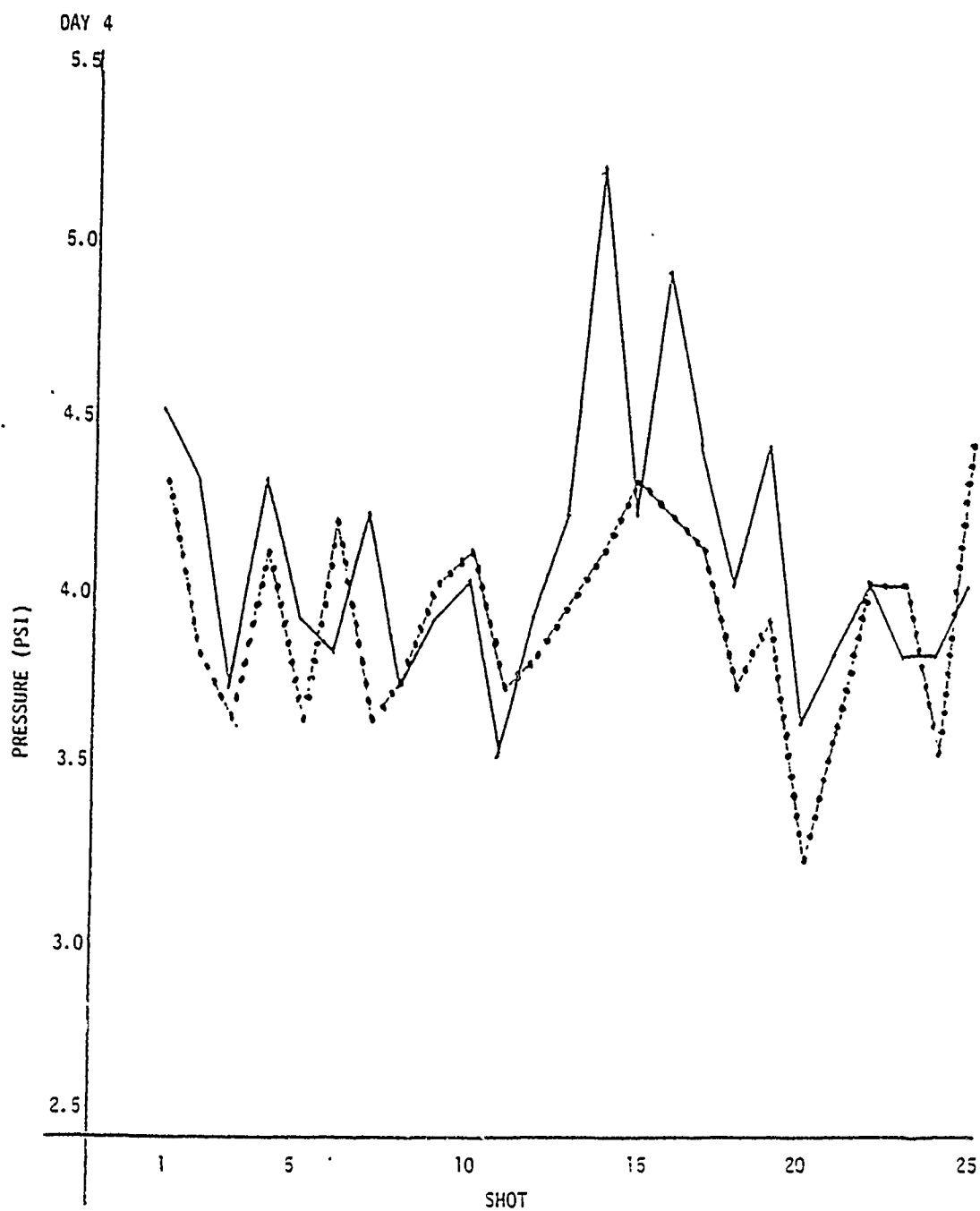


MAXIMUM RECORDED OVERPRESSURE

Taken From 80K Records With Pulse Calibration

GAGE 2 —————

GAGE 4 • • • • •

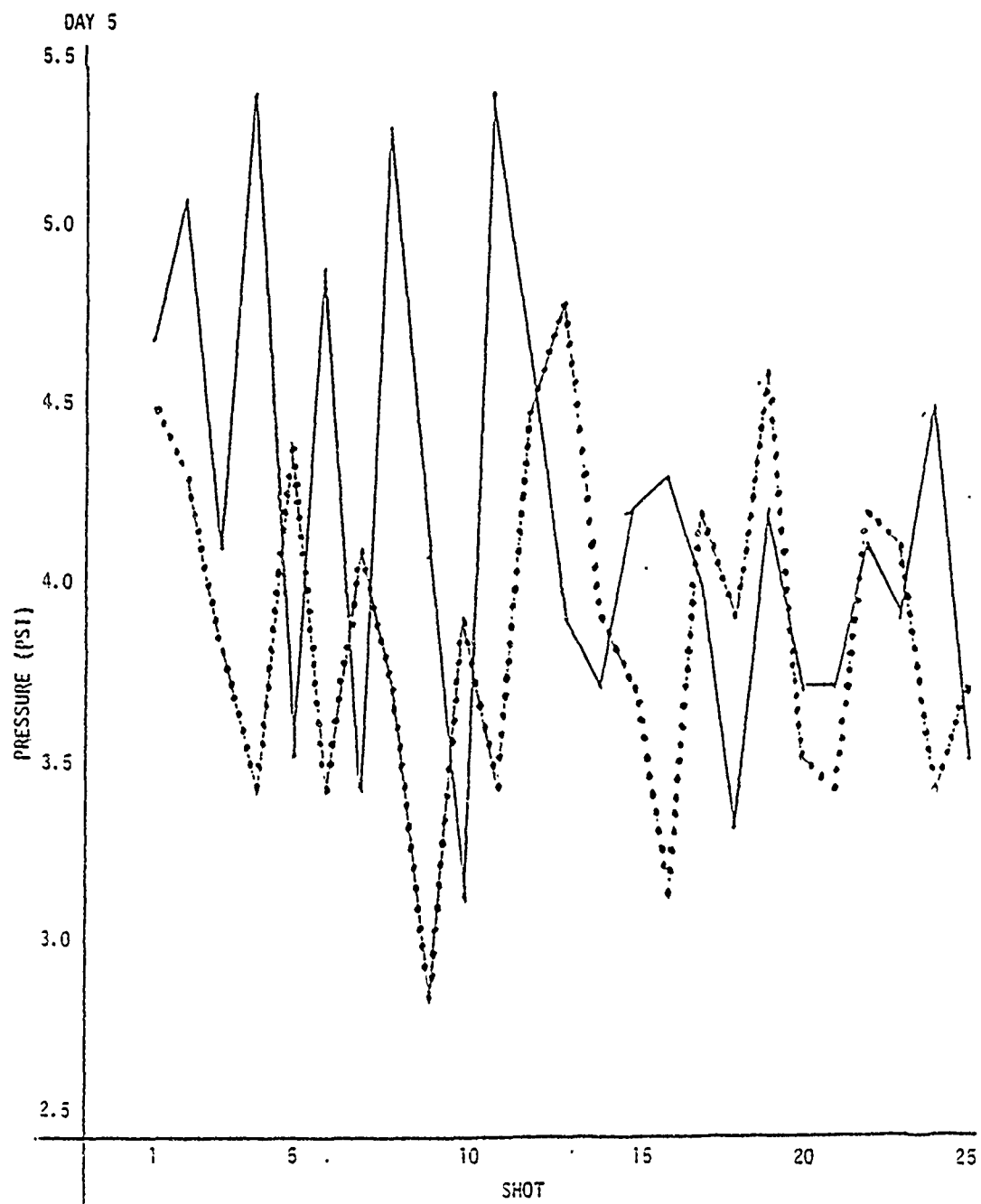


MAXIMUM RECORDED OVERPRESSURE

Taken From 80K Records With Pulse Calibration

GAGE 2 —————

GAGE 4 • • • • •



MAXIMUM RECORDED OVERPRESSURE

Taken From 80K Records With Pulse Calibration

GAGE 2 —————
GAGE 4 • • • • •

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